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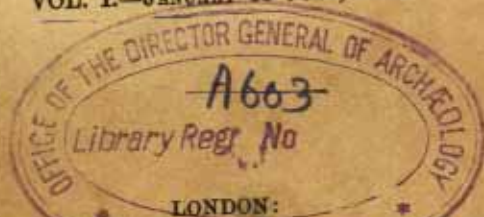
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NOTE.—The following contractions have been used in indicating the sources of Geographical Papers noted in the *Journal*.

<i>Actes Soc. Scient. Chili.</i> —Actes de la Société Scientifique du Chili. Santiago.	<i>Bol. Inst. Geog. Argentino</i> —Boletín de Instituto Geográfico Argentino. Buenos Aires.
<i>American Journ. Science</i> —The American Journal of Science. New Haven, Conn.	<i>Bol. Soc. Geog. Italiana</i> —Bollettino della Società Geografica Italiana. Rome.
<i>Ann. Géog.</i> —Annales de Géographie. Paris.	<i>Bul. Statist. Gen. Romaniei</i> —Buletin Statistic General al Romaniei. Bucharest.
<i>Bijdrag. Volkenkunde Nederl.-Indië</i> —Bijdragen tot de Taal-Land- en Volkenkunde van Nederlandsch-Indië. The Hague.	<i>Bul. Acad. Imp. Sci. St. Petersburg</i> —Bulletin de l'Académie Impériale des Sciences de St. Petersburg. St. Petersburg.
<i>Bol. Soc. Geog. Lisboa</i> —Boletim da Sociedade de Geographia de Lisboa. Lisbon.	<i>Bul. Soc. Anthropol. Lyon</i> —Bulletin de la Société d'Anthropologie de Lyon. Lyon and Paris.
<i>Bol. Soc. Geog. Madrid</i> —Boletín de la Sociedad Geográfica de Madrid.	<i>Bul. Soc. Géog. Lyon</i> —Bulletin de la Société de Géographie de Lyon. Lyons.

- Bul. Soc. Géog. Marseille*—Bulletin de la Société de Géographie de Marseille. Marseilles.
- Bul. Soc. Géog. Paris*—Bulletin de la Société de Géographie. Paris.
- Bul. Soc. Hongroise Géog.*—Bulletin de la Société Hongroise de Géographie. Budapest.
- Bul. Soc. Languedocienne Géog.*—Bulletin de la Société Languedocienne de Géographie. Montpellier.
- Bul. Soc. Roy. Géog. Anvers*—Bulletin de la Société Royale de Géographie d'Anvers. Antwerp.
- Bull. American Geog. Soc.*—Bulletin of the American Geographical Society. New York.
- Bul. Soc. Géog. Com. Bordeaux*—Bulletin, Société de Géographie Commerciale de Bordeaux. Bordeaux.
- Bul. Soc. Géog. Comm. Havre*—Bulletin, Société de Géographie Commerciale du Havre. Havre.
- Bul. Soc. normande Géog.*—Bulletin, Société normande de Géographie. Rouen.
- Bul. Soc. Roy. Belge Géog.*—Bulletin, Société Royale Belge de Géographie. Brussels.
- Bul. Soc. Anthropol. Paris*—Bulletin de la Société d'Anthropologie de Paris. Paris.
- Compt. Rend.*—Comptes Rendus des Séances de l'Académie des Sciences. Paris.
- Compt. Rendus Géog. Soc. Paris*—Société de Géographie, Comptes Rendus des Séances. Paris.
- Deutsch. Geog. Blätt.*—Deutsche Geographische Blätter. Bremen.
- Deutsch. Kolonialblatt*—Deutsches Kolonialblatt. Berlin.
- Deutsch. Kolonialzeit.*—Deutsche Kolonialzeitung. Berlin.
- Deutsche Rundschau*—Deutsche Rundschau für Geographie und Statistik. Vienna.
- Fennia*—Fennia, Bulletin de la Société de Géographie de Finlande. Helsingfors.
- Geog. Tidskrift (Copenhagen)*—Geografisk Tidskrift. Copenhagen.
- Jahresbericht Geog. Ges. München*—Jahresbericht der Geographischen Gesellschaft in München. Munich.
- Journ. and Proc. Roy. Soc. N.S.W.*—Journal and Proceedings of the Royal Society of New South Wales. Sydney.
- Journ. Asiat. Soc. Bengal*—Journal of the Asiatic Society of Bengal. Calcutta.
- Journ. Roy. Asiat. Soc. Ceylon*—Journal of the Ceylon Branch of the Royal Asiatic Society. Colombo.
- Journ. Roy. Colonial Inst.*—Journal of the Royal Colonial Institute. London.
- Journ. Roy. Stat. Soc.*—Journal of the Royal Statistical Society. London.
- Journ. Roy. United Service Inst.*—Journal of the Royal United Service Institution. London.
- Journ. Soc. Arts*—Journal of the Society of Arts. London.
- Journ. Franklin Inst.*—The Journal of the Franklin Institute. Philadelphia.
- Journ. Roy. Asiat. Soc.*—The Journal of the Royal Asiatic Society of Great Britain and Ireland. London.
- Miss. Cathol.*—Les Missions Catholiques. Lyons.
- Min. Proc. Inst. C.E.*—Minutes of Proceedings of the Institution of Civil Engineers. London.
- Mitt. Geog. Ges. Wien*—Mittheilungen der kais. - königl. Geographischen Gesellschaft in Wien. Vienna.
- Mitt. Verein Erdkund. Halle*—Mittheilungen des Vereins für Erdkunde zu Halle a/s. Halle.
- Mitt. Verein Erkunde Leipzig*—Mittheilungen des Vereins für Erdkunde zu Leipzig. Leipzig.
- Mitt. [Forsch.] Deutsch. Schutzgebiete.*—Mittheilungen von Forschungsreisenden und Gelehrten aus den Deutschen Schutzgebieten. Berlin.
- National Geog. Mag.*—The National Geographic Magazine. Washington.
- Norsk. Geog. Selsk. Arbog.*—Det Norske Geografiske Selskabs Årbog. Christiania.
- Nouv. Géog.*—Nouvelles Géographiques (Le Tour du Monde). Paris.
- Oest. Monats. für Orient*—Oesterreichische Monatsschrift für den Orient. Vienna.
- Peterm. Mitt. and Pet. Mitt.*—Dr. A. Petermann's Mittheilungen aus Justus Perthes' Geographischer Anstalt. Gotha.
- Proc. Roy. Artillery Inst.*—Proceedings of the Royal Artillery Institution. Woolwich.
- Proc. Roy. Soc. Victoria*—Proceedings of the Royal Society of Victoria. Melbourne.

- Revist. Soc. Geog. Rio de Janeiro.*—Revista da Sociedade de Geographia do Rio de Janeiro. Rio de Janeiro.
- Revue Géog.*—Revue de Géographie. Paris.
- Revue Française.*—Revue Française de l'Étranger et des Colonies: et Exploration, Gazette géographique. Paris.
- Rev. Marit. et Colon.*—Revue maritime et coloniale. Paris.
- Scot. Geog. Mag.*—The Scottish Geographical Magazine. Edinburgh.
- Sitzungsb. Akad. Wiss. Wien.*—Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Vienna.
- Sitzungsb. Preuss. Akad. Wiss. Berlin.*—Sitzungsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin. Berlin.
- Trans. Roy. Soc. Canada.*—Proceedings and Transactions of the Royal Society of Canada. Montreal.
- Tijd. Indische Taal-Land-Volkenkunde.*—Tijdschrift voor Indische Taal-Land- en Volkenkunde, uitgegeven door het Bataviaasch Genootschap van Kunsten en Wetenschappen. Batavia and The Hague.
- Trans. Geog. Soc. Pacific.*—Transactions and Proceedings of the Geographical Society of the Pacific. San Francisco.
- Trans. Roy. Geog. Soc. Austral. (Victoria).*—Transactions of the Royal Geographical Society of Australasia (Victorian Branch). Melbourne.
- Verhandl. Gesell. Erdkunde Berlin.*—Verhandlungen der Gesellschaft für Erdkunde. Berlin.
- Ymer*—Ymer. Tidskrift utgifven af Svenska Sällskapet för Antropologi och Geografi. Stockholm.
- Zeits. Gesell. Erdkunde Berlin.*—Zeitschrift der Gesellschaft für Erdkunde zu Berlin. Berlin.
- Zeitsch. deutsch-österreich. Alpenvereins.*—Zeitschrift des Deutschen und Oesterreichischen Alpenvereins. Vienna.

The Geographical Journal.

No. 1.

JANUARY, 1893.

VOL. I.

HOW CAN THE NORTH POLAR REGION BE CROSSED?

By Dr. FRIDTJOF NANSEN.*

GEOGRAPHICAL exploration has now made rapid progress, and most of the Earth's surface is already fairly well known. There are, however, two regions of our globe which have hitherto obstinately resisted all explorers: these are the regions around the poles. As science has advanced, and the world has become more and more known, problems have arisen which can only be solved by observations in these regions; it is now hardly possible to study physical geography, geology, meteorology, and many other branches of science, without being stopped by important questions which can only be answered in the Arctic and Antarctic regions, and in regard to which we can at present only offer highly uncertain hypotheses. It is therefore natural that the interest of the scientific world should more and more be turned towards the exploration of these regions, and I feel certain that all scientific geographers agree that they ought to be explored without delay; but as to the way in which this ought to be done, I am afraid there is much difference of opinion.

Each polar region is interesting in its own way, and we are not at all entitled to say that the exploration of the one would be of more importance than that of the other. It is certainly the North Pole which has hitherto attracted the greatest amount of attention, but the chief reason for this is probably the circumstance that it is situated in our own hemisphere. There is a striking difference between the two poles. The South Pole is surrounded, at a considerable distance, by a great ocean, while it is probably situated in a large continent covered by an immense ice-sheet, thicker and much more extensive than that of Greenland. The exploration of this ice-sheet would be a scientific event of the highest importance, and no one can doubt that one day it will be

* Read at the Meeting of the Royal Geographical Society, November 14th, 1892.
For map and diagrams see p. 96.

carried out. The Arctic regions, on the other hand, are on all sides surrounded by extensive land masses, while the neighbourhood of the Pole itself is covered by water. For this reason sailors have entertained the most fantastic ideas about an open Polar Sea, by which a short passage might even be found to the riches of China and India. They have tried to reach the Pole from all sides, but everywhere their hopes have been wrecked on the floe-ice, and the Polar Sea has been the grave of many a sailor's dreams of fame and wealth. I will here briefly mention the routes by which the principal attempts have been made.

Smith Sound was for some time thought to be the "high road" to the Pole, as some American explorers by this route had somewhat rashly professed to have seen the open Polar Sea stretching away to the north. All expeditions were, however, effectually stopped by floe-ice, carried down by a current from the north. Travelling over this ice was uncertain and difficult work, as may easily be concluded from the experiences of Markham, during his sledge journey towards the north on the Nares expedition. The most northerly points yet reached are, however, in this region, Markham having penetrated to lat. $83^{\circ} 20' N.$ (1876), and Lockwood, of the Greely expedition, to lat. $83^{\circ} 24' N.$ (1882).

Along the east coast of Greenland, attempts toward the Pole have been made, especially by the so-called second German North Pole expedition (1869-70). They were soon stopped by floe-ice swept southward by the polar current, and did not reach very high latitudes (c. $77^{\circ} N.$).

North of Spitzbergen, Sir Edward Parry made a most energetic attempt in 1827. When his vessel was stopped he left it, and tried to advance over the floe-ice, dragging boats and sledges with him. He reached lat. $82^{\circ} 45' N.$, where he was, however, obliged to return, as the ice was drifting so rapidly southward, that he could make no headway against it. In spite of the steamships of our time, nobody has reached Parry's latitude in this direction; but no serious attempt has been made since then.

In the direction of Franz Josef Land, attempts have also been made, but they have met with the same obstacle as elsewhere, viz. the polar ice. The ice was not here, however, carried southward, and this is a difference from what has been the case in the regions previously mentioned, which ought to be noticed. The Austrian *Tegetthoff* expedition was nipped off the coast of Novaya Zemlya, but was during one year and a half drifted in the ice north-east, north, and north-westward, till at last it was stopped by Franz Josef Land, which was thus discovered.

On the side of the Bering Strait only a few attempts have been made. The first was Cook's expedition in 1776, and the last that of the *Jeannette*

in 1879-81. Here, also, the same difficulty, the floe-ice, was met with, and in lower latitudes than anywhere else. The *Jeannette* was caught in the ice near latitude 71° N., and south-east of Wrangel Island. Here, we have, however, again a peculiarity as to the direction in which the ice is drifted; she was not carried southward but north-westward and nearer to the Pole. In this respect the *Tegetthoff* expedition, and that of the *Jeannette* differ from all others.

Why, then, have all previous attempts failed? The reason is simple enough. The expeditions were everywhere, at a greater or less distance from the Pole, stopped by the drifting floe-ice which formed immense impenetrable masses, and in most cases was carried down against the ships by currents from the north. It was impossible to penetrate the ice, and to walk over it was almost equally impossible, since it is moved by constant currents from the north; there was no choice left but to return. If we could only discover a land stretching to the Pole, the chances would be favourable enough. The difficulties of reaching it would not then be much greater than that of crossing Greenland. But we know of no country which is likely to have such an extension to the North. Greenland seems to end not very far north of the latitude already reached, and Franz Josef Land is probably only a group of islands.

Many people think that the North Pole can be reached by balloons or balloon ships, and that it will be so reached one day. I do not deny the possibility of this; on the contrary, I regard it as very probable. But the only way at present would be to entrust oneself wholly to the wind, and this is an uncertain way so long as we have no knowledge of the wind-currents of these regions. To go in a submarine boat under the ice would be rather risky so long as submarine navigation is as little developed as it is at present.

But is there no other way to reach the North Pole? I believe that if we take careful notice of the forces which Nature herself places at our disposal, and endeavour to work with them, and not against them, we shall find, if not the shortest, at all events the most certain route. We have already seen that most polar expeditions have been stopped by irresistible currents from the unknown north, carrying immense masses of thick floe-ice. From this fact we seem entitled to draw a very simple conclusion, namely, that if currents run from these regions, currents must also somewhere run into them, and that if expeditions have been carried by the ice southward from the unknown regions, others may be floated northward into those regions if they can only strike the currents on the right side. Thus, then, we have the way already indicated; the problem is to find the right place.

If we consider the experience of whalers and sealers who have sailed for a long series of years in the Arctic seas on both sides of the Pole, one singular circumstance must strike us at once, namely, that ships

caught in the ice on this side of the pole near the Greenland Sea are carried southward, and that the crews run, as a rule, no great risk. Not so, on the other side of the Pole north of Bering Strait; ships caught in the ice there drift northward and often disappear, some with few and others with many men on board; most of them probably are destroyed in high unknown latitudes. These facts must lead the thoughtful observer to the conclusion that there are differences in the sea currents which may be utilised in favour of a polar expedition. Let us, therefore, examine the question more closely.

The most important polar current is, without doubt, that which runs southward along the east coast of Greenland. This has a considerable speed, and carries an immense quantity of water out from the polar basin. It fills the whole opening between Greenland and Spitzbergen, with the exception of a narrow belt along the coast of the latter, and it runs over the deepest known bottom in the Arctic regions; there are ascertained depths of 2600 fathoms. The depth of the actual current itself cannot, however, be so much; I do not think that we are entitled to assume that there is any current of importance deeper than 300 fathoms; and in order to be within the mark, let us say only 200 fathoms. It might be expected that under this polar current another current was running northward. From what we know of the water, we seem, however, to be fully entitled to say that such cannot be the case. On the contrary, water at a much greater depth probably comes from the unknown north. The breadth of the polar current on the surface is 250 nautical miles, and at the depth mentioned it seems to be about 170 nautical miles. To calculate the average speed of the current is very difficult; it runs probably more rapidly at the surface than in its deeper parts, and, on the other hand, the speed is nowhere constant during the whole year. Sometimes, especially in the summer months, it is very rapid, but at other times it seems to have a much slower course. Taking everything into consideration, I do not think we are entitled to estimate the average speed of the whole current for the year at more than two nautical miles a day. By this calculation we arrive at the conclusion that the polar current between Greenland and Spitzbergen carries southward between 80 and 120 cubic miles of water every twenty-four hours.

Whence is all this water derived? It cannot originate at the pole itself; the place of the water that flows out from the polar basin must be supplied by water running in. It is also evident that the influence of a current so considerable as this cannot be limited to a small area; it must affect the polar basin like an immense pump, sucking the water even from the shores of Siberia and Bering Strait. This is the more certain, as the polar basin is found to be unusually shallow wherever it has been sounded. There are only a few currents known which run into the polar basin. A small branch of the Gulf Stream is known to

run northward along the west coast of Spitzbergen. This current is, however, too insignificant to be of much value in this connection; to some extent it certainly also rounds the north coast of Spitzbergen, and returns southward again towards its eastern coast. The main body of the Norwegian Gulf Stream passes eastward to the north of Norway, and enters the polar basin north of Novaya Zemlya. This current is considerable; our knowledge of it is, however, not sufficient to enable us to form any certain idea about the quantity of water which it carries along; but according to the calculation of Prof. H. Mohn, in his important memoir on the Northern Ocean,* and according to information from the sealers, I think we may assume that it carries at least 60 or 70 cubic miles of water every twenty-four hours into the polar basin. A third current running into the Polar Sea is that which runs northward through Bering Strait. This cannot be of great importance, as the strait is so narrow and shallow, but from the latest descriptions of the current we are perhaps entitled to assume that at least 10 or 14 cubic miles of water are here running northward daily.

The currents certainly furnish the most important supplies of water to the polar current along the east coast of Greenland. Another addition comes from the American, and especially from the Siberian rivers that run into the polar sea. The drainage area of all these rivers is very considerable, embracing nearly the whole of northern Asia, or Siberia, besides the principal part of Alaska and British North America. The rain and snow of this region are not, however, very considerable, and the whole quantity of moisture falling over Siberia I have calculated to be no more than about 626 cubic miles in one year if the Russian meteorological data on Siberia are correct. On account of evaporation we cannot assume that more than a certain part of this water reaches the Polar Sea; perhaps not more than one cubic mile daily during the year. This is not much, compared with the size of the ocean currents, but this addition is of special importance, as it consists of fresh and comparatively warm water which principally runs out into the basin during the summer, and which for a very long time keeps at the surface of the sea on account of its lightness, and thus produces surface currents running northward from the Siberian coast. This is also the reason why there is so much open water along this coast every summer. To this stream of fresh water the evaporation from the melting of ice in the Polar Sea contributes very little. The moisture of the air over the area draining into the Polar Sea must consequently originate mainly in the Atlantic and Pacific Oceans. This constant addition of fresh water must evidently be the principal reason why the water of the polar current between Greenland and Spitzbergen contains somewhat

* Prof. H. Mohn, 'The North Ocean; its Depths, Temperature, and Circulation. The Norwegian North Atlantic Expedition, 1876-78.' Christiania 1887.

less salt, even at considerable depths, than the water of the North Atlantic seas.

We thus see that the polar basin is daily receiving a large inflow of water. As little evaporation takes place from its ice-covered surface, there must necessarily be a corresponding outflow, and the most natural outlet is the broad and deep opening between Spitzbergen and Greenland. According to what has already been said the water running out here seems very nearly to correspond in quantity to the inflow mentioned.

Currents also run southward through Smith Sound, Jones Sound, and Lancaster Sound, in the Arctic Archipelago of North America, but as these sounds are very narrow and shallow, the body of water which their currents carry off is of little importance in this respect. The current running southward between Spitzbergen and Franz Josef Land is also insignificant when compared to the east Greenland current. By considering the contributions of water already referred to which this last current probably receives, it may be possible to form some idea of the approximate course of this current through the unknown regions. The waters of the North American rivers form, very likely, a portion of the currents through the Arctic Archipelago of North America; a small part of the current through Bering Strait, perhaps, runs also in this direction. We have left then, for the formation of the east Greenland polar current, the Novaya Zemlya current, the Siberian rivers, a part of the current through Bering Strait, and the moisture falling over the polar basin.

It seems quite natural that these sources should converge, and to some extent unite to form the Greenland current. We must expect, therefore, to find the main body of the current which is formed in this way, lying somewhere to the north of the middle of that extended area from which it receives its converging sources, and this place must consequently be somewhere in the neighbourhood of the New Siberian Islands. Here we also have the mouth of the Lena River, which carries a considerable body of comparatively warm water northward into the Polar Sea. From this region the current must naturally run in a northerly direction by the shortest route to the outlet between Spitzbergen and Greenland, and this must be to the north of Franz Josef Land and near or across the North Pole. But the direction of the current may perhaps, to some extent, be disturbed by the winds. Unfortunately we do not know much of these in the Arctic regions; from the little we know it would appear, however, that the winds should be favourable for such a current, and that their average direction during the year is very nearly the same as that which we have assumed for the latter. This we can also conclude from the observations made during the drift of the *Jeanette*.

I have tried to convince you that, from what we know about the

ocean currents and the winds along the "threshold of the unknown regions," we are entitled, in fact are obliged, to assume that these regions are traversed by an ocean current. But is there no direct evidence of the existence of such a current? I think there is.

The American *Jeannette*, under the command of De Long, was on September 6th, 1879, caught in the ice to the east of Herald Island (north of Bering Strait at about lat. $71^{\circ}30'$ N., long. 175° W.). This is the only case in which we know exactly the drift of a ship caught in the ice north of Bering Strait. Like all other ships caught there, the *Jeannette* drifted towards the north and north-west, but her course was at first very irregular, and to a great extent dependent on the varying winds. Her main drift, however, had a decidedly north-westerly direction; this course grew more and more direct the more the ship advanced westward, and during the last half year of her drifting she kept a pretty straight course, advancing north-westward with an average speed of no less than two miles daily, until she was crushed in the ice and sank on June 13, 1881, north of the New Siberian Islands (at about lat. $77^{\circ}15'$ N., long. 155° E.). This drift of the *Jeannette* shows that a current must be running north-westward from the sea north of Bering Strait. This current does not seem to have been very strong during the first part of her drift, but as she approached the region to the north of the New Siberian Islands the current seemed to get a stronger and stronger hold of her, and the last week before she sank she often drifted along with a speed of more than eight miles daily. This was just near the region where I have already supposed the Greenland current to originate.

More remarkable, however, in this respect than the drift of the *Jeannette* itself, is the fact that a number of objects belonging to her or her crew were found on an ice-floe near Julianehaab, on the south-west coast of Greenland, just three years after she had sunk (June 18th, 1884). These objects, fifty-eight in number, were found by some Eskimo, and were afterwards collected by the director of the colony of Julianehaab, Mr. Lytzen, who has described them in a paper in the *Geografisk Tidsskrift* (vol. viii., 1885-86, pp. 49-51), which is issued by the Danish Geographical Society in Copenhagen. Among these objects the following may be mentioned here:—1. A list of provisions with the signature of De Long, the leader of the *Jeannette* expedition, in his own handwriting; 2. A written list of the boats of the *Jeannette*; 3. A pair of trousers made of oiled linen, marked "Louis Noros," which is the name of one of the men saved from the *Jeannette*.

There seems to be some doubt as to the genuineness of these relics, and a well-known American traveller has even maintained that if the articles were found, it would seem more reasonable to trace them to the *Proteus*, which was wrecked in Smith Sound, about 1000 miles north of Julianehaab (in July, 1883). But how a list of provisions with De

Long's signature, a list of the boats of the *Jeannette*, a pair of trousers marked Louis Noros, &c., were brought on board the *Proteus* he does unfortunately not inform us. If the articles had still existed it would have been very easy to identify them, but unfortunately they are now lost. Mr. Lytzen sent them to a friend in Copenhagen, who had them for some time, and sent them to the International Exhibition at Amsterdam. After the close of the latter they were returned to the friend in a wooden case, and were placed in the cockloft in his house. A few years ago this man died, and his wife, not knowing what the articles were, allowed them to be destroyed, and I came just two months too late to save them. But I cannot see why these relics should not be genuine. What could the natives of Greenland know about the *Jeannette* and her sad fate? Or can it be supposed that Mr. Lytzen, a respectable official of Greenland, should have invented a story like this, and given a minute description of articles never found? Nobody who has read his description can easily believe such a thing, and that there should be any mistake or deceit is certainly much more improbable than the drift of a floe from Siberia to Greenland, which is certainly not at all improbable seeing that a great many other objects known must have drifted, and constantly do drift, the same way. The above-mentioned facts seem to speak for themselves, and need no further testimony. We have consequently to deal with the fact that an ice-floe, with objects from the *Jeannette* lying on it, was found near Julianehaab. These objects must have been left on the floe either near the place where the *Jeannette* sank or somewhere on the route of her crew towards the Lena delta. It is quite impossible that this floe could have come to the south-west coast of Greenland through Smith Sound, Jones Sound, or Lancaster Sound, as the currents through these sounds run southward along the west side of Baffin's Bay and Davis Strait, along the east coasts of Baffin Land and Labrador towards Newfoundland. No ice or objects coming that way reach the south-west coast of Greenland, along which a current runs northward, coming from the east coast (of Greenland) and round Cape Farewell, carrying along all the floe-ice and foreign objects which are found on the southern part of the west coast. There can consequently be no doubt that the floe which carried these relics from the *Jeannette* was borne along by the East Greenland current.

The question therefore arises: by what route did it travel all the way from the New Siberian Islands to the east coast of Greenland? The shortest and most natural route would, of course, be across the region to the north of Franz Josef Land, i.e. across the region round the pole; nay, we are obliged to assume this route as the only possible one. There is no probability that the floe should have been able to travel against the before-mentioned branch of the Gulf Stream, running eastward into the polar basin through the sound between Novaya Zemlya and Franz Josef Land, and that it should thus have passed westward to the south

of the latter, to the south of Spitzbergen and across the branch of the Gulf Stream, running northward along its western coast. Even if it were really possible that a floe could overcome all the difficulties of such a complicated route without being melted by the warm Gulf Stream, being broken up in the open sea, &c., it could not easily have travelled so far during so short a time as three years, seeing that the Austrians on board the *Tegetthoff* required one year and a half to be transported from Novaya Zemlya to Franz Josef Land.

These relics from the *Jeannette* thus seem to prove with all desirable clearness that there really exists such a current across the polar regions as that the existence of which we have assumed, from our knowledge of the currents of the northern seas. But there is other and even better evidence on which we can base our belief in the existence of such a current. Several years ago a "throwing-stick" or "harpoon-thrower" (a handle used by the Eskimo for throwing darts) of a peculiar shape was found on the west coast of Greenland, near Godthaab, and was afterwards given by Dr. Rink to the ethnological museum of Christiania. At first nobody knew whence it could have come, but on closer examination it appears that the only place where throwing-sticks of a similar shape occur is in Alaska, in the region of Port Clarence, Norton Sound, and the Yukon delta. The throwing-stick is, moreover, ornamented with Chinese glass beads which the Alaskan Eskimo get from the Asiatic side of Bering Strait. Thus it can have no other home than the west coast of Alaska, and it can only have reached Greenland in the same way as the objects from the *Jeannette*.

The best proof that the current must be constantly running from the sea north of Bering Strait and the Siberian coast, across the polar region, is the considerable amount of Siberian, and to some extent also perhaps of American, driftwood, which every year reaches the coasts of Greenland. The principal part of it is Siberian larch, and also red spruce. I have had the opportunity of examining a great deal of this wood on the west coast of Greenland as well as on the east coast. I have found it floating also on the sea among the floe-ice near Jan Mayen and Spitzbergen. Its appearance generally indicates that it has not been in the water for a very long time. For the Greenland Eskimo this driftwood is a necessity of existence, as it gives them material for all their weapons, implements, boats, sledges, tents, &c. Without it they would be in great distress, but they need not fear in that respect, for fresh supplies of wood are brought them every year by the polar current. Similarly, Siberian driftwood is found on Spitzbergen, especially on its northern coasts, and also in the sea north of this land among the ice-floes carried southward from the unknown north by that current against which Parry fought in vain. To this place the wood can only have come across the unknown north from Siberia, after having passed somewhere near the Pole.

A fourth proof that a current is constantly running across the polar regions is the thickness of the ice carried southward along the east coast of Greenland. This ice is much thicker than any other ice masses known in the northern seas. Ice of such thickness must have floated for a very long time in the sea; and as immense masses of similar ice are constantly carried southward, it cannot have been formed in the sea north of Spitzbergen or anywhere near the Pole, for in that case it would not have had time to grow thick in floating to the lower latitudes where we meet it. Along the Siberian coast, as well as in the sea north of Bering Strait, the ice is as a rule comparatively thin; during the drift of the *Jeannette* it was found that the average thickness was 7 to 10 feet. This must indeed strike one as being very strange, considering that the sea near the New Siberian Islands is part of the coldest region known on the earth. The reason is evidently that the ice of these seas is not generally more than one year old, as it is every year carried northward by the currents. It seems, then, to be a natural conclusion that it is the same ice which we find again in the East Greenland polar currents, and which has grown thicker on the way across the polar regions.

Quite recently I have received an interesting and remarkable confirmation that this conclusion as to the origin of the thick ice is right. During my last expedition to Greenland I collected samples of dust and mud from the ice-floes between Iceland and Greenland. These samples were some time ago sent to the Swedish geologist, Dr. A. E. Törnebohm, in Stockholm, who has now examined them, and found about twenty various minerals in them. The great variety of these minerals is striking, and in a letter to me Törnebohm says: "Can it be possible that the terrestrial portions of the dust originate from northern Siberia? that it is partly mud carried into the sea by the great Siberian rivers? The great variety of minerals contained in the dust seem to me to indicate that it originates from an extensive land region, and thus it seems most natural to think of Northern Siberia." At this remarkable conclusion has the Swedish *savant* arrived, as he states in a later letter, only judging from the nature of the mud itself, and even without knowing my views as to the polar current and the origin of the ice. But the more valuable is the opinion of such a prominent geologist. As will be understood, I quite agree with Dr. Törnebohm on this point, and I do not think there is room for much doubt, as some parts of the mud occurred in such thick and local layers that they could hardly have been brought on to the ice by anything but water. Even more interesting than the above-mentioned is, that a considerable part, or about the half, of the mud was of organic nature, mostly humus, which indicates that it originates from a soil containing much humus. It can consequently not be glacial mud carried out on the ice by the rivers of Greenland or other Arctic countries; it must have come from some other coast of

the polar sea, and we are again led to Siberia as the nearest and most natural home. Most interesting is, however, in my opinion, the diatoms found in some samples of dust from the surface of the snow of the floes. These have been examined by Prof. Cleve, of Upsala, the great authority on diatoms. He says of them: "The diatom flora of this dust is quite peculiar, and different from that of all the many thousands of samples which I have examined with the exception of one, with which it shows the most complete congruity, viz., a sample which was collected by Kjellman (during the *Vega* expedition) on the floe-ice at Cape Wankarema, near Bering Strait. The species and the varieties are completely the same in both samples." Prof. Cleve has been able to determine sixteen different species and varieties. All these were also found at Cape Wankarema, and *twelve of them are only known from there, and from nowhere else in the whole world*; and that though the diatom flora of the Kara Sea, Franz Josef Land, Spitzbergen, and Greenland has also been partly examined. Cleve is certainly right when he concludes his letter thus: "It is quite remarkable that the diatom flora on ice-floes near Bering Sound, and on the east coast of Greenland, are so completely alike, and so unlike all others. It indicates that there is an open communication between the seas east of Greenland and north of Asia." I think this is a most cogent proof of the correctness of my assumption, that the polar ice on the east coast of Greenland originates in the sea to the north of Siberia.

Another interesting proof, of a scientific nature, may also be mentioned here, which perhaps shows that there has been an open communication between the seas north of Europe and near Bering Strait in a post-glacial period. By examination of a great many specimens of pumice found on the shores of Norway, Spitzbergen, and Greenland, Bäckström, a Swedish geologist, comes to the conclusion that they consist of the group of minerals called Andesites, and cannot originate from any volcanic region in or near the Atlantic Ocean, as no pumice of similar structure and composition is now known in these regions. The pumice-stones must, therefore, in his opinion have been carried southward by the polar current, and must either have originated from unknown volcanoes in the polar regions, or from the great Andesitic volcanic regions near the Bering Sea. The latter supposition he thinks to be the more natural, and the pumice-stones have been floated northward by the current through Bering Strait and across the polar regions, along the route followed by the throwing-stick from Alaska. And as great quantities of this pumice-stone occur on the above-mentioned coasts, there must in a post-glacial period have been a constant communication by the aid of sea-currents between the latter region and the place where the pumice originated. As the pumice-stone is found at some height above the level of the sea, 30 to 70 feet, it must have been brought there by the sea in a period when the land had not yet risen to this height above the present shore. If Bäckström's supposition is right this

shows that the communication between Bering Strait and the sea between Greenland and Europe is of no very recent date, and has in the post-glacial period been even more extensive than to-day, as the most northern shores of Europe were also favoured with it.

From all these facts we seem fully entitled to draw the conclusion that a current is constantly running across the polar region to the north of Franz Josef Land from the sea north of Siberia and Bering Strait, and into the sea between Spitzbergen and Greenland, and as we have seen, the floe-ice is constantly travelling with this current in a fixed route between these seas. Since such is the case, the most natural way of crossing the unknown region must be to take a ticket with this ice and enter the current on the side where it runs northward—that is, somewhere near the New Siberian Islands—and let it carry one straight across those latitudes which it has prevented so many from reaching.

There are two methods of trying to attain the result I long for. First, to build a strong ship so constructed that it can withstand the pressure of the ice, and living in this ship, to float across with the ice; or, second, to take only boats along, encamp on an ice-floe, and live there while floating across.

My plan is based on the use of both these methods. I have now built a wooden ship as small and as strong as possible; it is just big enough to carry provisions for twelve men for five or six years, besides the necessary fuel; her size is about 600 tons displacement with light cargo. She shall have an engine of 160 indicated horse-power, which will give her a speed of 6 knots, with a consumption of $2\frac{3}{4}$ tons of coal in twenty-four hours. With sails alone she will likely attain a speed of 8 or 9 knots under favourable circumstances. She will consequently be no fast vessel nor a good sailer; but this is of relatively little importance on an expedition like ours, where we shall have to depend principally on the speed of the current and the ice-movement, and not on that of the ship. A ship's ability to break her way through the pack-ice does not at all depend on her speed, but on her steam power and her shape. For it is naturally the thing of importance to get a strong ship, and the most important feature in her construction is, that she shall be built on such lines as will give her the greatest power of resistance to the pressure of the ice. Her sides must not be perpendicular, as those of ships generally are, but must slope from the bulwarks to the keel; or, to use a sailor's expression, her "dead rise" must be made great, so that the floes shall get no hold of her when they are pressed together, but will glide downward along her sides and under her, thus tending to lift her out of the water. The sides of most ships used in the Arctic seas have been almost straight up and down, in spite of which defect they have stood the pressure of the ice pretty well, and many of them have even been lifted completely out of the water, and have for longer or shorter times stood dry on the ice without being damaged. This

practically happens very often with the small sealing-vessels from the north of Norway which catch seals and walrus in the sea round Novaya Zemlya and Spitzbergen. These ships are often built merely of pine-wood, but yet they are lifted on to the ice; the captains think this a cheap way to get a dry dock and make use of the time to paint their ships, &c., until the floes separate again and the ship sinks into the water, so that they can continue their voyage. Though the *Jeannette* had a shape which in this respect was very bad, and though she was an old and not very strong ship, she managed to withstand the ice pressure for nearly two years twenty-one months. It will consequently be understood that a very slight alteration of shape will give us a very strong ship, and one which can scarcely be crushed by the floe-ice if it is properly handled. For the same reason the vessel ought to be as small as possible, as the lighter she is the more easily she will be lifted by the ice, and the less pressure there will be on her sides; it is also easier to make a small ship strong than a big one. A small ship has other advantages, as it is more convenient to navigate and to handle in the ice, and it is easier to find good and safe places for it between the floes.

As great length is a weakness during the pressure and twisting of the pack-ice, the ship ought also to be as short as her necessary bearing capacity will allow. The result of this in connection with the very sloping sides is, that our ship is disproportionately broad compared with her length. Her breadth is about one-third of the latter. Flat sides are avoided as much as possible near the places which will be most exposed to the attack of the ice, and the hull has plump and rounded forms. There are no sharp, projecting corners; every edge is broken and rounded. Even the keel does not project very much; it is almost covered by the plankings, and only 3 inches are visible outside the ice-skin, and the sharp edges are quite rounded. On the whole the ship will, I hope, leave no place for the ice to catch hold of. Round and slippery like an eel, she will escape its cold and strong grasp.

The ship will be pointed at both ends, and, on the whole, she resembles very much a Norwegian pilot-boat, or, as I am told, a Scotch buckie-boat, only that she of course is carvel-built, and that the keel and the sharp bottom are cut off. Her bottom is near the keel, comparatively flat, in order that she shall have something to rest on without being capsized in case she should be completely lifted on to the ice. Both stem and stern are considerably curved in order that the ice shall get no hold there. The stem is also much sloped, because it will then more easily force the ice-floes under her when she is breaking her way through the ice.

The screw can be raised when necessary, and protected from damage in a well. It can also easily be changed if it is broken, and for that purpose we shall carry two reserve screws. This is, as will be known, a

usual arrangement in modern sealers or whalers; but besides this, the rudder can also easily be unshipped and raised through a well. This is, I think, a fortunate and ingenious idea of the shipbuilder, Mr. Colin Archer, and it is a very simple arrangement. The rudder is, moreover, placed so low that it will be entirely submerged even when the ship is lightly loaded. This is so arranged in order that the ice shall not be able to strike it, and thus break it by even a sudden pressure or movement; it will instead meet the strong stern. The latter is the Achilles heel of the sealers and whalers, where the ice may very easily damage them by breaking the rudder. During my last voyage with the *Jason* to the east coast of Greenland we had such an accident, showing how easily it may happen. When the rudder, then, is not so arranged as in our ship, it takes a long time to have it unhooked and another put on, especially when you have no great crew. Our stern is, as usual, furnished with two perpendicular stern-posts, one a propeller-post, the other a rudder-post, made of big oak timbers about 27 inches broad. On both sides of these are bolted very big and strong curved oak timbers, running along the sloping stern upwards to the deck, thus forming in a way a double stern. Between them are the wells, through which the screw and rudder can be lifted. This stern construction is very simple, and certainly exceedingly strong.

The stem is of course also made very strong. It is composed of three big oak baulks, one inside the other, so that the thickness of solid oak is 50 inches. Inside the stem big and strong breasthooks of oak and iron are placed to connect the ship's sides with each other and with the stem. From these breasthooks stays go to the pawlbit, in order to strengthen the stem and divide the pressure. Outside this wooden stem comes an iron one, and outside this again come transverse iron bars and plates, which go some small distance backwards on each side, to protect the wood against the ice.

Both the stem and the stern-posts are, of course, carefully attached to the keel by strong cross and longitudinal iron clamps and wooden knees. When I add that the stern is also protected by an iron sheeting, it will, I hope, be understood that the two extremities of our ship are pretty well protected.

The keel is made of two big baulks of American elm, 14 inches square. As is already mentioned, it will be almost covered by the outer planking, so that there will only be a projection of a few inches. Above the frame timbers are placed two keelsons, one 17 inches and the other 12 inches in height, both bolted together to the timbers and keel.

The frame timbers are made of selected Italian oak, which is very hard. Only naturally-curved timbers are used; such are much stronger than those curved by the help of the axe. These timbers were

originally meant for some man-of-war, and were thirty years ago bought for the Norwegian navy; they may thus be said to be well-seasoned. The thickness of the frame timbers is about 10 to 12 inches; they are ranged in couples, squared, and bolted together, all joints being bound with iron. The pairs of frames are placed almost close together, leaving only a space of 1 to 2 inches between each. These spaces were left in order to give the very dry timbers a little room in case they should swell when they come into water; the spaces are, however, filled with a mixture of pitch, tar, and sawdust, so that if the outer plankings were shaved away the vessel would still remain nearly water-tight.

The ceiling consists of pitch-pine planks, alternately 4 and 8 inches in thickness. It is twice carefully caulked with oakum to make it tight. The planking consists of three layers; first, a 3-inch oak layer, over which another of 4 inches, and finally an outer planking, or "ice sheathing," of greenheart, which increases in thickness from the keel towards the water-line from 3 to 6 inches. Greenheart is, as you will know, a very hard, strong, and slippery wood, well fit to protect the hull against the damage of the ice, its only fault being that it is so heavy that it sinks in water. Each layer was carefully caulked with oakum and pitch in the ordinary way before the next skin was placed on to it.

The whole thickness of sides of the ship is thus 28 to 32 inches—a solid mass of pitch-pine, oak, and greenheart, with a little pitch in between. It will easily be understood that a ship's side of such dimensions and material will alone have a great power of resistance to the pressure of the ice. But this power is, to a very essential degree, increased by the many beams, stays, and strengthenings of every kind placed inside the vessel. How these are arranged will be seen in the diagrams (Fig. 5). There are two decks, an upper and lower one, each of 4-inch red pine. The deck beams are of oak and pitch-pine 10 or 11 inches square. Numerous upright stanchions and stays are placed as supports to the beams and the sides; they unite the beams of the two decks to each other and to the ship's sides. The principle of arrangement of the stays is, that they shall be placed as perpendicular on the ship's side as possible, in order to strengthen these against pressure from the outside, and to divide the latter. For this purpose the perpendicular stays between the beams of the two decks, and between the lower deck-beams and the keelsons, are also very well fitted. As may be seen in the drawings, stays, beams, and the ship's sides are strongly united to each other by large wooden knees and iron. The whole is like one coherent mass, and the ship may almost be considered as if built of solid wood.

The beams of the lower deck are placed somewhat under the water-line, where the pressure of the ice will be worst. In the after-part, above the engine, we were obliged to raise the deck a little, in order to

give room for engine and boilers; but instead the beams are here supported by two sloping stanchions on each side instead of one, so that also this part must be considered as very strong. As the lower deck was raised, we were also obliged to lift the upper one in order to give room for the cabins. These are thus covered by a half-deck, or poop, 3 or 4 feet in height.

The whole ship is divided into three rooms, or divisions, by two water-tight wooden bulkheads, so that if the vessel, in spite of all, should happen to spring a leak, there will still be two water-tight divisions left to keep her floating. She is also furnished with pumps, one of which will be a great centrifugal pump, which may be driven by the engine and put into communication with all the divisions, and thus empty the vessel in a short time in case she should leak.

The most important feature in the rig of a polar vessel ought to be, that it is as simple and as strong as possible, and at the same time it should be light, and make little resistance to the wind when the vessel is steaming. For these reasons we have chosen to rig her as a three-masted fore-and-aft schooner, the sails of which are very easy to handle from the deck, which also is of some importance when you have a small crew not consisting of first-rate sailors only. On the foremast there will also be two loose yards for a square foresail and topsail. The area of her sails will be about 650 square yards. The under-masts are rather high and strong; the mainmast is 82 feet in length, and the topmast is 50 feet. On the top of this is the crow's nest, which thus will be at a height of about 105 feet above the water. It is of importance that the crow's nest be placed as high as possible, in order to get a wide view over the ice.

The quarters for officers and crew are so arranged that the saloon (Fig. 4, S), is in the middle, on all sides surrounded by the cabins (L, L, Fl), the galley (K), and the bunkers (B); thus, by help of these rooms, the saloon is well protected against the cold and moisture arising from the ship's sides. One of the greatest difficulties with the life on board the vessels of most polar expeditions has been, that the moisture of the warm air in the small cabins was condensed on the cold sides of the ship, and was there frozen to ice. The mattresses in the berths on these walls were therefore very often transformed into as many lumps of ice. To avoid a repetition of this has, of course, been of importance to us. We have therefore located the saloon as described in order that we may all live there night and day, in case it should be necessary, during the most severe cold. We shall thus follow the same principle as the Eskimo, living many people in a small room to make it warm; we shall certainly not then want much to heat it.

But besides this, every precaution is taken to isolate the walls and make them warm, and to prevent the moisture being condensed on them. The ship's sides are, on the inner side, covered with tarred felt; then

comes a thick layer of cork; inside this a wooden wainscot; then a layer of felt a few inches thick; next comes a nearly air-tight layer of painted canvas, or linoleum; and then another wainscot. The air-tight canvas is there in order to prevent the warm and moist air from inside penetrating into the layers of felt and cork, and giving off moisture there, thus transforming them into ice. This principle we have followed, on the whole, also in the roof. The walls between the cabins and the saloon are made in a similar way, and the roof and floor are very thick, consisting of many layers. In the roof there is, amongst others, a layer of reindeer-hair a couple of inches thick, which I think must be very effective as a heat insulator, as the reindeer hairs are so very porous and elastic. On the floor and walls may, of course also be laid bear-skins and carpets, to make them still warmer. I hope you will get the impression that everything is made to give us a snug and comfortable saloon and cabins, fit for a climate such as we may expect.

The principal dimensions of the vessel are as follows:—Length of keel, 101 feet; length at water-line, 113 feet; length over all, 128 feet; beam at water-line amidship, excluding the "ice-sheathing," 33 feet; greatest beam, excluding the "ice-sheathing," 36 feet; depth moulded, 17 feet; the draught with light cargo is 12 feet; the displacement is then about 530 tons, but when, with heavy cargo, the draught is 15½ feet, the displacement will be about 800 tons. Her freeboard will then be only 3½ feet. Such will probably be the case when we leave the last place where we can get coal, as we will of course then load her with as much as she can carry. We will soon burn a good deal in the engines, and she will gradually be lifted again.

The hull, with boilers filled, weighs about 420 tons. With a displacement of 800 tons, she has consequently a bearing capacity for 380 tons of coal and cargo. Our equipment and provisions will not likely weigh much more than 60 or 70 tons; thus 300 or 320 tons' bearing capacity will be left for coal and fuel, and this is enough for about four months' steaming with full speed. We shall not, however, likely be able to make use of our engines more than two months after we have been loaded with coal for the last time. A great quantity will thus be left for heating and cooking during the winters. For heating purposes we shall also carry petroleum, which has the great advantage of giving light besides. For the cooking we shall carry alcohol.

The vessel was launched at Laurvik on the 26th of October, and was named *Fram*, which means "forward." I hope she will accomplish what this name promises.

Fram will certainly be the strongest vessel ever used in the Arctic regions. She is built with great care, and I feel certain that she can be crushed only in a quite extraordinary combination of circumstances. With this vessel, and a crew of twelve strong and well-picked men, besides an equipment for five or six years, as good in all respects as

modern appliances can afford, I think the enterprise has a good prospect of success.

It is my intention to start next spring. Our first goal will be the New Siberian Islands or the mouth of the Lena River. I have been uncertain whether I will go through the Kara Sea, or will prefer the route from the side of Bering Strait; but think now that I shall take the former. When we have reached the sea north of the Lena delta we shall have to wait for the right moment to go northward along the western coasts of the New Siberian Islands, and try to reach the farthest possible point north in open water. This will probably be in August or the first days of September. The current caused by the warm water from the Lena River will certainly be a great help to us, as it seems to be of great influence during the summer, producing an extensive open sea, in which one of the boats from the *Jeannette* was even wrecked. To be able to navigate the ship properly through the ice I thought of using captive balloons. By help of these we could easily in clear weather get a splendid view over the surroundings, and see where there is ice and in what direction there is open water; we should then in a moment see what direction to take as clearly as if we had it traced on a chart, and should lose no time by trying in a wrong direction. The great difficulty is, that there is very much fog in this region just on account of the warm Lena water; but a good clear day with balloon work would then be the more valuable, and would make up for a great many others with fog. A still greater difficulty is, however, that the balloon equipment, especially the steel cylinders with the compressed hydrogen, are so heavy that I fear it would be too difficult to carry them in our small ship, and as they are also very expensive, I fear I shall have to give them up.

When we can get no farther we shall have nothing left but to run into the ice at the most favourable spot, and from there trust entirely to the current running across the polar region. The ice will perhaps soon begin to press, but it will only lift our strong ship. While drifting we shall have plenty of time and excellent opportunity to make scientific observations. Probably we shall in this way, in the course of some years, be carried near the Pole, or across it, and into the sea between Spitzbergen and Greenland, where we shall get into open water again, and be able to return home.

There is, however, a possibility that the ship, in spite of all precautions, may be crushed in the ice; but if this happens the expedition will have another resource. It will now be time to use the ice as quarters instead of the ship, and we shall have to move all our provisions, coal, boats, &c., to an ice-floe, and camp there. Besides the light ordinary boats I have built two big boats for this purpose, 29 feet long, 9 feet broad, with flat bottom, and so deep that we can sit and lie comfortably inside them. They have a deck, and are so big that the whole crew can live

even in one of them. These boats will be placed side by side on the ice, will be covered with thick warm tents and snow, and will give us two good warm saloons. Thus we can continue our journey. There is certainly no reason why one should not be able to live comfortably enough in this way if one is only prepared for it. The only difference will be that we have now got two small ships standing on the ice instead of the big one lying between the floes. When we emerge into open water on this side of the Pole there will not be any great difficulty in returning home in our boats; such a thing has been done many times before.

It is my conviction that the only difficulty will be to get duly into the current north of Siberia; when this is fortunately done, we must be carried somewhere northward. There is no case in which a ship has been nipped in the pack-ice without being carried in some direction. Whether we will succeed or not, I feel convinced that this is the way in which the unknown regions will some day be crossed. To travel in this manner is certainly no new fashion; it has been tried many times before. I need only remind you of Sir Leopold M'Clintock's drift with the *Fox* during eight months in the winter of 1857-58, when he drifted 1200 miles from the northern part of Baffin's Bay down towards Labrador. Several years later (1872) a party from the *Polaris* expedition drifted on an ice-floe even a longer distance very nearly along the same route. Along the east coast of Greenland many such ice-drifts have occurred. I may remind you of the whole fleet of whalers—about twenty-eight in number—which in June, 1777, were nipped between lat. 74° and 75° N., and which drifted in the ice southward along the whole East Greenland coast. The last ship was crushed in October, in lat. $61^{\circ} 30'$ N., after having drifted a distance of 1250 miles in 107 days. Some of the men continued the drift on the ice, rounded Cape Farewell, and reached at last the Danish settlements on the west coast, their whole drift being about 1600 miles or more. In the winter of 1869 and 1870 the *Hansa* crew drifted on an ice-floe, as you will remember, along the same coast, very nearly the same route, and the same distance as the whalers in 1777, until they, after nine months, arrived safely at a settlement west of Cape Farewell. During our attempt to land on the east coast of Greenland, in 1888, we also, as will be known, had some little experience in this drifting, and in 1882 I also tried a little of it with a Norwegian sealer.

In the sea between Novaya Zemlya and Franz Josef's Land the Austro-Hungarian expedition in the *Tegetthoff* drifted for a period of one year and a half; but as I have already mentioned, a striking difference between this drift and those above-mentioned is, that it had no southern direction, it went north-east, north, and north-westward. In this respect the drift of the *Jeannette* during two years from a point to the north of Bering Strait is also most remarkable, as it went in a north-westerly direction.

It will thus be seen that drifting in the ice is no new mode of travelling in the Arctic regions, neither is it new to make discoveries in this way. During the drift of the *Tegetthoff* the most important Arctic discovery of recent times was made, viz., Franz Josef Land, and during the drift of the *Jeannette* several islands were discovered. The only new feature in my plan will be, that *I wish* to be drifted, while these previous expeditions drifted *against* their will.

There is a possibility that we may be stopped by unknown lands near the Pole, or that we may strike an eddy or a side current, but we hardly run any great risk in any of these cases. If, in the former case, we should fail to get our ship afloat again, we should have to leave her and strike out for the nearest current to drift on again, or return homeward travelling over the ice. When we only take care to travel with the current and not against it there will certainly be no special difficulty in doing this; and if the distance should be too great, we should leave all boats, taking only light sledges with necessary provisions, &c., besides canvas for boatmaking, walk on until we reached Spitzbergen or any other land where there is open water. Here we would make boats of canvas, or if possible of the skins of seals or walruses, like that we made when we reached the west coast of Greenland. If we are caught by a side current this must at last bring us somewhere; it cannot for ever run in a ring near the Pole; and wherever we come near the coasts of the Polar Sea we shall have no difficulty in returning home. It may be possible that the current will not carry us exactly across the Pole, but *the principal thing is to explore the unknown polar regions*, not to reach exactly that mathematical point in which the axis of our globe has its northern termination.

The only experience which can give us some idea as to the time the current will require to drift the expedition across is the drift of the relics from the *Jeannette*. If we assume that they required one year for the drift southward along the east coast of Greenland from latitude 80° N. only two years remain for the rest of the journey, and this requires a speed of no more than two nautical miles daily. This does not seem too high a rate when we remember that the *Jeannette* drifted at the same speed the last half year of her drifting. It cannot therefore be considered improbable that we should reach open water on this side of the Pole within two years after our start from the Siberian side. One cannot, however, expect that the course will be one straight line forward during all this time. There will certainly come periods during which the drift is quite stopped, or when we may even be carried backward, and the route and time can thus easily be lengthened; but when we, as already mentioned, take provisions for five or six years we may consider that we have an ample margin. This may perhaps seem to many to be a long time, but there is a great advantage in this route, and that is, that when the expedition is once well begun there will not be much help in looking

backwards; our hope will then lie on the other side of the Pole, and such a knowledge is a good help to get *Fram*, or forward.

There are a great many things in our equipment which ought also perhaps to be mentioned; but as this paper has already become so long, I shall only mention a few of the most important points.

To get fresh food we will shoot as much as possible, and for this purpose we will carry light sealing boats as also Eskimo kayaks. The use of these excellent light craft I learnt to appreciate in Greenland; they are very good to shoot and fish from, can easily be carried long distances over the ice, and can be used wherever there is a little open water.

To make excursions over the ice in case we shall meet with land—which of course is very likely—we will take dogs, sledges, “ski” and snow-shoes with us, besides full equipment for sledge-travelling. I hope to spend a great deal of the time in this way by making excursions in all directions where anything of importance may be expected. For entertainment during the long winter nights, as well as for all kinds of scientific work, a good library will naturally form a most important part of our equipment.

Our scientific equipment will be chosen with the greatest care, and the best instruments accessible will be taken. I shall not, however, tire you with an enumeration of them; they will naturally, to a great extent, be much like what other Arctic expeditions have had. I may only mention that I have also got a pendulum apparatus and the necessary astronomical universal instrument, in the hope that we may get some opportunity of making pendulum observations on northern latitudes, which is of course of the greatest interest.

One of the greatest difficulties we will have to overcome will perhaps be the scurvy. It has been very bad on many previous expeditions, and during the long time we expect to be away it is not impossible that it might occur. I do not, however, consider this to be very probable. I am examining the question very closely, and all possible precautions are being taken to avoid it. In our time science ought to be able to produce an equipment as regards provisions which will make scurvy an impossibility. It is a ghastly enemy, that is true, as we do not know its nature and origin. But it seems as if it almost never occurs except in connection with badly-preserved meat, and especially salted meat, and I cannot understand why then we should take such a thing with us; there is plenty of other things to choose among. Alcoholic drinks will of course not be taken.

To live a healthy life in all respects is naturally very important. Two of the principal conditions to keep one's health are, heat and light. In order to produce the necessary heat, we live together in a small room during the coldest season, as is already mentioned. We will also have good warm clothes. Woollen ones I regard as best for indoors, but in

the open air, skin or canvas suits to put outside the woollen clothes are necessary to protect one against the biting wind and the snowdrift. To heat our saloon there will certainly not be much wanted even during the severest cold. A few paraffin lamps or a small paraffin stove will certainly be sufficient. There will of course also be care taken to get good ventilation. We thus run no risk, I think, of suffering from the want of heat. With the light it is, however, worse. Almost no organism can exist without that, and therefore various illnesses occur during the long Arctic nights. This it would seem difficult to avoid in regions where the darkness lasts six months. I believe, however, that we shall be able to overcome this difficulty also by help of the wonderful electric light. We shall have a dynamo for producing electricity. Many will perhaps ask how we shall get the necessary power to make it work. This cannot, however, be difficult. On one hand we have the wind. The meteorologists are certainly of opinion that this will not, as a rule, be very strong in the cold over the Polar Sea; but a little we must find there also, and if the sails of our windmill are made sufficiently big, we do not want much to turn them. But even when there is no wind at all we will be able to produce power. We are twelve men, strong, and well-picked, as I hope, and when a capstan is arranged on deck we will be able to do work similar to that which a horse does in its horse-mill on land. In this capstan four men take their turn at a time; thus we will obtain good and regular exercise—somewhat monotonous perhaps—and will at the same time be useful by producing electricity, so that we can have an electric arc-lamp burning eight hours a day. Everybody will understand what a blessing that must be when one is surrounded by constant darkness. When the sun begins to sink to disappear behind the horizon in the south for the last time we begin to walk in a ring in the darkness on the deck of our ship, in order to produce a new sun. In this way we will slowly move forward. I hope that you, ladies and gentlemen, will sometimes send us a kind thought while we go round in our mill there far north in the solemn silence of the long polar night.

Admiral Sir LEOPOLD MCCLINTOCK: I think I may say this is the most adventurous programme ever brought under the notice of the Royal Geographical Society. We have here a true Viking, a descendant of those hardy Norsemen who used to pay this country such frequent and such unwelcome visits. One cannot but admire Dr. Nansen's splendid enthusiasm. He has adduced some very striking proofs as to the current to which he intends to trust himself and his companions; he has shown us that the current is proved to extend to the north-west from Barents Strait, at least to lat. 77° ; has reminded us of the Dutch fleet frozen in on this side the Pole in lat. 78° – 80° between Spitzbergen and Greenland, and which drifted south, sometimes in sight of Greenland, sometimes in sight of Iceland, until the last one was crushed somewhere near Cape Farewell. Thus we have a north-west current running in, and a south-west current running out, and the unknown intervening space, the so-called Polar Basin, is 1500 geographical miles; and this is just

the space which has so many attractions for Dr. Nansen, that he proposes to drift across it. I wish to say only a few words, and those with reference to the minor currents, with which I am personally acquainted or have had some experience. We find on the American Islands an enormous pressure of Polar ice, very different in character from anything further south, pressing in from the west and choking up all the channels between them, up to 83° N.; but though this heavy ice bars the channels, it does not stop the flow of the current underneath, which runs into Baffin's Bay and so gets into the Atlantic Ocean; and this may have some bearing upon Dr. Nansen's current. I sincerely trust Dr. Nansen will succeed in getting into mid-current north of the New Siberian Islands, because then he will be in less danger of being impeded by all these American Islands on the one hand, and Spitzbergen and its neighbouring islands on the other, whereon are cast great quantities of Asiatic timber—trees brought down by the Siberian rivers; so I suppose as Siberian driftwood can be carried, Dr. Nansen's ship could be carried, and I hope he will come straight through. But all these dangers are very small as compared with the dangers of the ice to which he proposes to trust himself. This great Polar ice is so much heavier than that which is met with in Straits, or in Baffin's Bay, which discharge their ice annually into the Atlantic. De Long was beset in one year's ice about 6 feet thick; nearly two years later with the same ice, which had grown very much thicker round the ship, the *Jeannette* was crushed. At that time the thaw had not commenced, and the ice was still firmly frozen to her sides, so that for the ship to have been pressed up, would have been an exceedingly difficult operation. The ice imprisoned in this Polar basin for some years grows thicker from year to year. Dr. Scoresby tells us that the great ice fields in lat. 80° average in thickness 10–24 feet, and where hummocks occur it is often up to 40 feet or even 50 feet. By the crushing of the floes these great masses are pressed against each other, and overlaying, get frozen together, so that there may be almost any thickness of ice. Dr. Nansen has very fully described his ship to us, and I think she should accomplish all that any vessel could do. He attaches much importance to the wedge shape of the vessel under water, where the ice pressure will tend to lift her up. My own last Arctic vessel the *Fox* was precisely of that build; and the rotten ice, not more than a foot above the surface of the water in summer-time, would crush against her sides, pass under her, and still crushing against the wedge-shaped bottom, tend to lift her up, and so she frequently escaped from being crushed. I am glad to say she was never squeezed by the ice during the winter months, when the ice was of quite a different character—more like rock frozen fast to the ship's side. The possibility of sliding up on to the ice is then, I think, very remote. Dr. Nansen has alluded to his boats, 29 feet long, as being convenient for the reception of his men on the ice. I would prefer much more portable boats, such as could be readily and quickly removed from any position of danger; for these floes are so frequently rushing against each other and crushing together, that what is safe at one moment may half an hour afterwards be extremely unsafe; it is better, therefore, to have portable boats, and I would trust to snow huts built upon the ice, for shelter in the extreme cold. While I wish Dr. Nansen complete and speedy success, it will be a great relief to his many friends in England when he returns; and more particularly to those who have had some experience of the dangers at all times inseparable from ice navigation, even in regions not quite so far north.

Admiral Sir GEORGE NARES: It is a delicate duty to criticise the details of any voyage fully determined on, and is especially so in regard to an exploring voyage to be undertaken by another nation. But as Dr. Nansen has submitted his programme to this Society, the Arctic members are bound to give you

their opinion. In anything I say Dr. Nansen may be sure that it is said in a friendly spirit, with the greatest admiration of his plucky proposal, and his powers of endurance and readiness of resource under extreme circumstances, as displayed in the past. I would also say at once that, whatever the result of the voyage may be, we are satisfied that he will give us on his return a good account of such parts of the Polar area as he may reach. The adopted Arctic axioms for successfully navigating an icy region are, that it is absolutely necessary to keep close to a coast-line, and that the farther we advance from civilisation the more desirable is it to insure a reasonably safe line of retreat. Totally disregarding these, the ruling principle of the voyage is that the vessel—on which, if the voyage is any way successful, the sole future hope of the party will depend—is to be pushed deliberately into the pack-ice. Thus her commander—in lieu of retaining any power over her future movements—will be forced to submit to be drifted helplessly about, in agreement with the natural movements of the ice in which he is imprisoned. Supposing the ocean currents are as stated, the time calculated as necessary to drift with the pack across the Polar area is several years, during which time, unless new lands are met with, the ice near the vessel will certainly never be quiet, and the vessel herself never free from danger of being crushed by ice pressure. To guard against this the vessel is said to be unusually strong, and of a special form to enable her to rise when the ice presses against her sides. This idea is no novelty whatever; but when once frozen into the Polar pack the form of the vessel goes for nothing. She is hermetically sealed to, and forms a part of the ice-block surrounding her. The form of the ship is for all practical purposes the form of the block of ice in which she is frozen. This is a matter of the first importance, for there is no record of a vessel frozen into the Polar pack having been disconnected from the ice, and so rendered capable of rising under pressure as a separate body detached from the ice-block, even in the height of summer. In the event of the destruction of the vessel, the boats—necessarily fully stored, not only for retreat, but for continuing the voyage—are to be available. This is well in theory, but extremely difficult to arrange for in practice. Preparation to abandon the vessel is the one thing that gives us the most anxiety. To place boats, &c., on the ice packed ready for use involves the danger of being separated from them by a movement of the ice, or of losing them altogether should a sudden opening occur. If we merely have everything handy for heaving over the side, the emergency may be so sudden that we have not time to save anything. So the only feasible plan is to arrange for sledges, boats, stores, &c., to be as accessible as possible, and, in the words of De Long, "Stick to the ship as long as she will stick to us, and when she is ready to leave us try to be a little readier to leave her." As to the direction of drift of the Polar ice we all agree with Dr. Nansen as to the southerly movement of the water between Spitzbergen and Greenland. We may, therefore, accept the homeward carrying current on which he proposes finally to depend. He has, in my opinion, overstated its depth; but that does not in the least affect his main deductions. We may also infer that a similar movement of the water, with a reducing velocity, will be met with north and north-east of Spitzbergen for a distance of 500 or 600 miles—that is, to about as far as the Pole itself. Of the other water movements, there is the current from the Atlantic towards the Barents Sea. This is proved by the drift of Weyprecht and Payer to be so slight that it was completely overpowered by the wind pressure. The wind it was that carried them to Franz-Josef Land. Again, the reported Bering Strait current has so slight an effect along the Siberian coast that De Long—in the *Jeannette*, and while retreating south over the ice—was similarly drifted about by the prevailing winds, and by them

only. De Long frequently refers to the fact, and his final record left on the ice after the vessel disappeared states—"As the prevailing winds are from the south-east, this ancient ice moves slowly along to the north-west. There are no currents which are not caused by the wind prevailing at the time." There remains for consideration the effect of the fresh water discharge from the rivers. This, doubtless, exerts an influence some distance seaward, but only during the summer and autumn; and even then the largest cannot cause any appreciable movement in the ice farther than about 200 miles from the mouth. Beyond this distance seaward, the wind-drift must overpower that produced by any other means. As to the probable direction of the drift, the *Fram*, starting from near the mouth of the Lena river, may expect to meet the main pack no farther north than about lat. $76^{\circ} 30'$. I doubt her getting farther north before she is beset; but, taking an extreme case, and giving her 60 miles more, she will then only be in the same latitude as Cape Chelyuskin—730 miles from the Pole, and about 600 miles from my supposed limit of the effective homeward carrying ocean current. After a close study of all the information we possess, I think the wind will be more likely to drift her towards the west than towards the east. With an ice-encumbered sea north of her, and more open water or newly-made ice to the southward, the chances are small for a northerly drift, at all events, at first; and, afterwards, I know of no natural forces that will carry the vessel in any reasonable time much farther from the Siberian coast than the *Jeannette* was carried, and, during the whole of this time, unless protected by newly-discovered lands, she will be to all intents and purposes immovably sealed up in the pack and exposed to its well-known dangers. There is no doubt that there is an ocean connection across the area proposed to be explored. In conclusion, I join with Dr. Nansen in considering that the principal aim of all such voyages is to explore the unknown Polar regions, not to reach exactly that mathematical point in which the axis of our globe has its northern termination, and I offer him my hearty wishes for a successful voyage.

Admiral Sir E. INGLESFIELD: After the remarks made by the distinguished Arctic navigators who have just spoken there is little for me to say. I think I can give Dr. Nansen a word of encouragement by telling him that on my second voyage I walked up one shore of Wellington Channel to meet Sir Edward Belcher, and one evening we were lucky in finding a pine tree one foot in diameter, and about—as far as I can remember—15 to 16 feet long, with the bark upon it, and very little bruised. We know it can have come from no other part of the world but Siberia. I may add that a portion of the bark of that tree was brought home, and the naturalist with a microscope discovered seeds and matter upon it which assured him it had not been more than a few months in the water. This was on the western shore of Wellington Channel, which, as everyone knows, runs into Raffen's Bay. I made three voyages to Beachy Islands, &c., the first in a little yacht of 150 tons, the others in Government vessels of 800 tons; and I may say that if I had to go again I would prefer the 150-ton vessel.

Sir ALLEN YOUNG: I am called upon unexpectedly to say a few words, and really after what we have heard from Sir Leopold M'Clintock and Sir George Nares there is little left to say. I believe there can be no doubt that these relics from the *Jeannette* were genuine, and must have drifted on the floe on to which they were thrown when the ship was abandoned, and could have come to the Greenland coast in the time, by no other way but across the Pole, or nearly so. Dr. Nansen assumes that the blank space around the axis of the earth to be a pool of water or ice; I think the great danger to contend with will be the land in nearly every direction near the Pole. Most previous navigators seem to have continued seeing land again and again further and further north. These *Jeannette* relics may have

drifted through narrow channels, and thus finally arrived at their destination; and, I think it would be an extremely dangerous thing for the ship to drift through them, where she might impinge upon the land and be kept for years. It is only to be hoped that Dr. Nansen will be equipped with such gear as to enable him in case of disaster to retreat to open water; and I quite agree with Sir Leopold M'Clintock that these large boats will not be available for that purpose. With reference to land about the Pole I may mention that when I was at Upernavik on the west coast of Greenland, the Governor had a reindeer skin which had been branded with a mark like those which the Siberians use for their tame reindeer, and tame reindeers are unknown in Greenland; therefore this reindeer must have come from the coast of Siberia, either round the north point of Greenland or across the inland ice. It must have come across islands stretching from some point in Siberia; and this goes to prove that there are islands on the way. We know, of course, that the Gulf Stream washes the shores of Norway, and also Novaya Zemlya, and turns again to the westward, as is evidenced by the fact that glass balls used by the Norwegian fishing-boats are found on the west coast of Greenland. It reaches, perhaps, to Franz Josef Land; but further we know nothing save from the relics of the *Jeannette*, which afford strong proof of the existence of such a current. Dr. Nansen says that the *Jeannette* was not a strong ship. I am glad to say that I found the *Pandora*, as she then was named, an extremely strong ship. We had some severe nips, and yet the ice did not come through her, although on one occasion some of her beams were broken. In my opinion she was too strong; for had she not been so strong she would have been crushed in the first winter, and those heroic men who have gone and whose loss we all deplore, would have been still with us. I do not think the form of the ship is any great point; for when a ship is fairly nipped the question is if there is any swell or movement of the ice to lift the ship. If there is no swell, the ice must go through her whatever she is made of. The great danger to the *Fram* is in case she is impinged against some land and there remains. I hope Dr. Nansen will start from the west of the New Siberian Islands, because island after island were discovered by the *Jeannette*, and if he commences his drift from the north or north-west of these islands, he will start on a fairer basis than from the eastward. I only wish Dr. Nansen a most happy voyage, and that he may get through, and soon be with us again.

Captain WIGGINS: It is so late that I cannot say all I should like to say upon this most interesting question of Dr. Nansen and his glorious scheme. It gives me great pleasure to meet Dr. Nansen for the first time. I have never had the pleasure of shaking hands with him yet, but I shall not allow him to leave this platform until I do. I should have liked to have seen the track shown on the chart; I understood he was to go by Bering Strait and to the north of the New Siberian Islands in the track of the *Jeannette*. With such a route I could not see my way clear to say one word in favour of Dr. Nansen's adventurous voyage. I have heard since from his own lips that he rather contemplates going by waters nearer home, and what is of more importance, taking up what I recommended in 1876, the route inside Novaya Zemlya through to the Kara Sea, thus taking the full swing of the Gulf Stream, which we know flows in there with great force and regularity; and it must go somewhere. To those seas I have been seven or eight voyages, and never yet returned on account of ice. The thermometer there shows us 45° to 50° Fahr. in the water passing through the Straits. I cannot to-night say one-half of what I should like to say, but if I could have the honour of doing what I have never done in this room—reading a paper—I could, in an hour and a half, make it very clear that it might not be impossible to take the ice and cross the regions of the Pole, if not the Pole itself. As I pointed out in 1876, I found open water all the

way to Dickson's Harbour in 1874-75, and I believed the best course to the Pole would be through the Kara Sea, not further east than the Chelyuskin promontory, i.e., 100° long. The only risk will be, as Sir Allen Young pointed out, the question of land. No doubt land will be found distributed about the Pole more or less, even shoals. It has been found before, not only by the *Jeannette*, but by the Austrian expedition in the *Tegetthoff*, which I had the honour of searching for in 1874 in the *Diana*; and when I found them at Hammerfest they acknowledged I was quite right in advising them to go inside the Kara Sea. I felt certain the best currents were there; and along the Siberian shore there are always natives who could help. De Long did not lose his life for want of natives, but by exposure in the boats; he perished at the mouth of the Lena by the storms; the two men who escaped easily found the natives. I would advise Dr. Nansen not to take the New Siberian Islands, as they are most treacherous, low, sandy, muddy, horrible places, and on account of the Lena, there is broken water all the year round, and that is bad for sledging. Baron Wrangel found open water there in midwinter. With regard to going on the top of the ice I am at one with Dr. Nansen, the only difference being that I believe in small things. I did my first voyages in the *Diana* of 120 tons, and was crushed upon the top of the ice, and in my ignorance, in 1874, rammed the ice in splendid style, and had some hair-breadth escapes, having entered the Kara Sea too early in June and July. I should recommend instead of so large a vessel a smaller one, or to take a small one with him, as with a small vessel you can do much more on the top of ice than with a large one. A vessel may rise when it is squeezed by the ice, though the chances are much against it. The *Tegetthoff* rose until her keel was on top of the ice, like the model of a steamer on a table. I should recommend, if there is room, not to wait for a squeeze, but to run the vessel as far on top of the ice as possible. A small vessel of 20 or 30 tons might be easily hove round a headland like a huge sledge on the top of ice-floes. If I were going now I would take three small vessels—or at any rate two—as being better than one big one. I should recommend Dr. Nansen to go through the Kara Sea, and on the 100th parallel the current would be always with you. I wish him God speed.

Captain WHARTON, R.N.: At this late hour I will say a very few words. As I have not Arctic experience I suppose I am called upon as the professional guardian of the currents of the world, and all I can say on that point is that so far as Dr. Nansen has spoken about the currents that are known he is correct. He speaks of articles thrown upon the coast of Greenland: that is according to fact. As regards the ice I cannot tell you anything. I believe, after close investigation into known currents, that Dr. Nansen is quite justified in supposing there is a drift from the New Siberian Islands, or that side to Greenland, but as to its direction or speed that, as he has told us, is pure speculation. He is not going into this matter with his eyes shut. He has argued the question out very closely, and given us an admirable paper. People sometimes ask, What is the use of Arctic exploration? Amongst other things I think it may be said that its use is to foster enterprise and bring gallant men to the front. To-night we have an excellent example of that in Dr. Nansen. I can only say to him, "God speed."

The PRESIDENT: It is very late, and although there are still many eminent Arctic travellers present—Admiral Ommanney, Dr. Rae, and others—I think it will not be your wish to hear any further speakers. I ought to mention, however, that I have received a long letter—too long to read—from Sir George Richards on this subject; and, although admiring Dr. Nansen, he is obliged to speak unfavourably of his project, adding that anyone speaking with authority ought to speak out when so much is at stake. Dr. Nansen will perhaps like to answer in a few words, and then the meeting will close.

Dr. NANSEN: I use this opportunity to express my most hearty thanks to those eminent Arctic men who have given their opinions and criticism upon my scheme to-night. I must, at the same time, say that I could get no better encouragement for my expedition, because their criticism has not been able to convince me that I am wrong in my opinion about the currents or about the expedition. Sir Leopold McClintock, Sir George Nares, and Sir Allen Young say that it would be impossible for the ship to be lifted during the winter, but that it would be frozen in. Well, I will not detain you by giving you my opinions about that, but will only say that we have, as Captain Wiggins mentioned, one very good instance of a ship being lifted during the winter, viz., the *Tegetthoff*. She was lifted so high that her keel was above the surface of the ice. That, in my opinion, is enough to prove that the vessel can be lifted even in the winter, and that she may drift in the ice for years without being crushed, if she is only strong enough to withstand the pressure necessary to lift her. The *Tegetthoff* indeed, was safe when she was deserted because of the fear that she would not move again. It is also maintained that my boats are too heavy; but I had not the time to read all about the equipment of the expedition, or I could have told you that I am going to carry about ten boats of various sizes, and some of these will be exceedingly light. Of course, the heavy boats are only to be placed on the ice for living in, because the small boats are too small to live in comfortably. Sir George Nares said he thought an Arctic expedition should always secure a line of retreat. I am of the opposite opinion. During my expedition to Greenland I proved that it is quite possible to accomplish something when you have no retreat, for we then burned our ships behind us, and, in spite of it, got across Greenland; and I hope to be as successful when we break the bridge behind us this time, if no other circumstances intervene to prevent us from getting through. Sir George also referred to the great risk run by the boats through floating ice. I refer you to the experience of the *Hansa* Expedition. They kept their boats for a whole winter drifting south along the east coast of Greenland, and when the hut they built of their coal was broken by the breaking up of the ice they took refuge in their boats, sleeping on board during the nights for safety; so I do not think it impossible to keep boats safe on the ice if you only take proper care of them. This was also my experience in drifting along the East Coast, and we had some bad experiences. The worst thing in that respect is, in my opinion, not the ice, but the surf, and we run no risk of that in the Arctic regions when surrounded by ice. As to the winds:—I mentioned in my paper, that according to my opinion the winds will not be against us, but in favour of my scheme; in fact, the wind is the principal cause of the currents, and if we can say with certainty that a definite current is constantly running in a distinct direction, we may as a rule conclude that the average direction of the winds go the same way; but I think we need not go further into this question at present, as we actually know very little of the winds in the unknown Arctic regions; the only experiences of much importance in this respect are those of the *Tegetthoff* and the *Jeannette*, and they do not seem to speak in my disfavour. In my opinion Sir George Nares was not able to prove that my arguments for the existence of such a current as I assume were wrong. Sir Edward Inglefield was kind enough to mention the finding of drift-wood from Siberia on the shores of Wellington Channel coming from the north. So long as that and similar evidences are undeniable facts, I think it shows that there must be ice constantly floating across, as the drift-wood cannot dive under the ice. As regards the ice conditions, at the New Siberian Islands I have received some information from Baron von Toll, who has spent two years there, and I regret time will not allow me to give you details; but the sense of it is that the sea generally is open to the west of the New Siberian Islands during August. How far north that prevails nobody

knows, but in my opinion it cannot be a short distance, as the River Lena sends out a quantity of fresh warm water during the summer into the shallow Polar Sea, and produces a current running north. I thank Sir Edward most heartily for the proof of the current he has given. I quite agree with Sir Allen Young that one of the greatest risks is to meet land, and as I said in my paper it is very likely that we will meet land further north. The *Tegetthoff* expedition was stopped by land, but I do not think that such a thing is likely to happen very often; if there is land in the north it is, of course, quite possible that we may drift against it, but the probability is that the current shall carry us past it, as it does with most part of the ice; and this will become the more certain if we get into the heart of the current; but if we are stopped we have nothing to do but to leave the ship and travel on with the current. If we only keep with the current and do not go against it I do not think it impossible to reach open water and get home in that way. I must thank Captain Wiggins for his most interesting remarks, but I must say I never thought of taking the *Jeannette* route; my idea was at first to go through Bering Strait and along the Siberian coast to the New Siberian Islands, and thence go north, as I thought that it would be easier to reach these Islands that way than through the Kara Sea and past Cape Chelyuskin. By examining the question more closely, I have come to the conclusion that the advantage of this first route is not quite certain; and then, of course, I prefer the shorter one through the Kara Sea. I quite agree with Captain Wiggins that the best route to follow is to keep as much to the coast as possible; therefore my ship was made to draw as little water as possible in order to be able to travel inside the ice along that shallow coast. Captain Wiggins recommended a small ship; I think a ship 29 feet long ought to be small enough, and I have two such small ships. I will conclude by thanking the Geographical Society and the English Arctic explorers for the cordial way in which they have received me and my scheme.

The PRESIDENT: You have listened to Dr. Nansen, you have admired his foresight in anticipating and providing against difficulties, his resource, his ingenuity in details, his courage and his enthusiasm. You have heard the views of some of our greatest Arctic authorities. The views of some others which there has not been time to read, including those of Sir Joseph Hooker, whose experience was gained in the Antarctic regions, and as I have already mentioned, those of Sir George Richards will be laid before you in *The Geographical Journal*. Dr. Nansen will no doubt reflect upon what has been said and written, but for the members of the society at large to pronounce any definite opinion upon such keenly-disputed questions as are involved in Dr. Nansen's plans would be out of the question; what we can do is to assure him of our most cordial good wishes and to give him as I now do our warmest thanks for his paper.

The following communications have been received from Admiral Sir George H. Richards and Sir Joseph D. Hooker, who were unable to be present at the meeting:—

I venture to offer a few brief remarks on the paper which has been read by the distinguished Greenland traveller and explorer, Dr. Nansen. Dr. Nansen, in his paper, deals mainly with the currents, known and unknown, in the Arctic regions, and he appears to trust almost entirely to their influence for the accomplishment of his object in reaching the Pole, or rather in being drifted from a position near to the New Siberian Islands, across the Pole to Greenland, a distance, in a direct line, of about 1400 miles. Now to make myself clear I must give in a few words my views of these currents. I believe that there is a constant outflow (I

prefer this word to current) from the north in consequence of the displacement of the water from the region of the Pole by the ice-cap which covers it, intensified in its density by the enormous weight of snow accumulated on its surface; this outflow is doubtless more pronounced in the portion of the Arctic Circle between the west end of the Parry Isles and Spitzbergen, where the numerous groups of islands cut it up into narrow straits and passages which form so many ducts for its escape to the south. Over the other portion of the Circle which we know less about, and which embraces a far larger extent of sea, it is doubtless less pronounced in a southerly direction, and there is no decided current through Bering Strait one way or the other, which is probably owing to the very shallow water (less than 20 fathoms) for a considerable distance on either side of its entrance; Bering Strait is the only outlet on that side of the Pole.

Now this general southerly outflow which I have mentioned is of a very weak character, considered as a current, and every ship which has ever penetrated north has had to do so against it, and has found no difficulty in doing so while there has been sufficiently open water or loose ice to make steam or sail power available; when this has not been the case, and a ship has not got within the inner waters before the new ice of autumn is formed, she is certain to be carried back by this outflow by slow degrees with the ice, and to reach the open water probably early in the spring. I cannot find any reason for believing that a current sets north over the Pole from the New Siberian Islands which Dr. Nansen hopes for and believes in. Dr. Nansen, I think, calculates it at about 2 miles a day; there is nothing in the *Jeannette* expedition to support such a theory; she made something like 900 miles from Bering Strait in nearly two years, in a direction north of west, or nearly with the line of coast, and was then crushed near the position where Dr. Nansen's current commences.

It is my opinion that when really within what may be called the inner circle, say about 78° of latitude, there is little current of any kind that would influence a ship in the close ice that must be expected; it is when we get outside this circle, round the corners as it were, into the straight wide channels, where the ice is loose, that we are really affected by its influence, and here the ice gets naturally thinner and more decayed in autumn, and less dangerous to a ship. Within the inner circle probably not much of the ice escapes; it becomes older and heavier every year, and in all probability blocks the navigation of ships entirely. This is the kind of ice which was brought to Nares' winter quarters at the head of Smith Sound, in about $82^{\circ} 30'$ north, and this is the ice which Markham struggled against in his sledge journey, and against which no human power could prevail.

I must not omit to allude very briefly to the only tangible evidence which Dr. Nansen brings in support of his currents, viz., the articles said to have been found in Greenland belonging to the *Jeannette*. I don't for a moment impute any bad faith to the authors of this story, nor do I include it among the many fables which have been rife since the Franklin Expedition, most of them made to order as marketable articles, but I attach no real importance to it. If found in Greenland they may well have drifted down on a floe from the neighbourhood of Smith Sound, from some of the American Expeditions which went to Greely's rescue. It may also well be that some of "De Long's" printed or written documents, in regard to his equipment, may have been taken out by these Expeditions, and the same may apply to the other articles. But even if it were possible to accept this evidence it would only mean that a piece of ice with these relics had been coach-wheeled in some way round the polar basin to Greenland in three years, and could not afford a very encouraging hope for Dr. Nansen's ship. I regret to have to speak discouragingly of this project, but I think that any one who can speak with authority, ought to speak plainly

where so much may be at stake. I have always rested my hope of the North Pole or its neighbourhood being reached by sledge journeys along the land ice, north of Smith Sound. The expedition of 1875, however, under Nares dissipated this hope by proving the improbability of any land at a convenient distance in that direction, and if this is so, there remains only the possibility of its accomplishment by ship navigation. I confess that I have never been an advocate of amateur nautical expeditions for such service as this; and for obvious reasons. It must be admitted, however, that they have one advantage; their anxieties are not added to by the knowledge that they become the objects of rescue almost before they are well into the regions of danger.

In Government Expeditions, especially from this country, the excessive caution which it is perhaps necessary to insist on to ensure the certainty of a safe retreat, demands a system of supports which fetters the action of the commander, and by separating his ships during winter, deprives him virtually of half his travelling force in early spring. Such reasons will probably be a bar to any Government Arctic enterprise for many years to come; whatever may be undertaken in the Antarctic region, which is virgin ground, and where the conditions are probably so different, that it may not be necessary to pass a winter, at any rate where a reconnaissance would first be made. The solution of the Polar problem, if it is ever solved, may therefore possibly be effected by some such effort as the present one.

All British Arctic men will, I believe, hope that Dr. Nansen may be the successful explorer, and that he may reap the reward due to his pluck and enterprise. They will certainly welcome him home, successful or unsuccessful, long before the expiration of the almost countless years for which he is prepared to persevere. I think he is very wise to commence his voyage by way of the Kara Sea, instead of by Bering Strait, to reach which and get on the threshold of his labours a voyage of about 20,000 miles must first be accomplished. By adopting Nordenskiöld's course he is certain at any rate to add something to our knowledge of these little-known regions.—GEORGE HENRY RICHARDS.

In compliance with your request, I have carefully studied Dr. Nansen's able and clear statement of his reasons for adopting the course he has chosen for reaching the hitherto unexplored Arctic area, and his preparations for its accomplishment.

Dr. Nansen's project is a wide departure from any hitherto put in practice for the purpose of Polar discovery, and it demands the closest scrutiny, both on this account and because it is one involving the greatest peril. The following considerations respecting it have occurred to me.

From my experience of three seasons in the Antarctic regions I do not think that a ship, of whatever build, could long resist destruction if committed to the movements of the pack in the Polar regions. One built as strongly as the *Fram* would no doubt resist great pressures in the open pack, but not any pressure or repeated pressures, and still less the thrust of the pack if driven with or by it against land. The "lines" of the *Fram* might be of service so long as she was on an even keel, or in ice of no great height above the water-line, but amongst floes and bergs, or when thrown on her beam-ends, they would avail her nothing.

The contingency of the *Fram* being, by a divergence of the assumed currents, stranded on the north coast of Greenland, or of the American Polar Islands, or elsewhere, should be taken into account. Assuming that a landing could be effected, it must be on an inhospitable and probably ice-bound coast, or on the mountainous ice of a palæocrystic sea. With a certainly enfeebled, and probably

reduced ship's company, there could, in such a case, be no prospect of reaching succour.

Putting aside the possibility of scurvy (against which there is no certain prophylactic), have the depressing influences on the minds of the crew, resulting from long confinement in very close quarters during many months of darkness, extreme cold, inaction, ennui, constant peril, and the haunting uncertainty as to the future, been sufficiently taken into account? Perfunctory duties and occupations do not avert the effects of these conditions; they hardly mitigate them, and have been known to aggravate them.

I do not consider the attainment of Dr. Nansen's object by the means at his disposal to be impossible; but I do consider that the success of such an enterprise would not justify the exposure of valuable lives for its attainment; and I may conclude with expressing the hope that Dr. Nansen may dispose of his admirable courage, skill, and resources in the prosecution of some less perilous attempts to solve the mystery of the Arctic Area.—JOS. D. HOOKER.

EXPLORATION AND CHARACTER OF THE PRINCIPAL NEW ZEALAND GLACIERS.*

By A. P. HARPER, Hon. Sec. New Zealand Alpine Society.

THE broad features of the mountain system of the South Island of New Zealand are tolerably well known, and need only be briefly referred to here. Beginning at the north end of the South Island, we find, in Nelson and Marlborough Provinces, numerous ranges spreading from coast to coast, and reaching in many instances to over 8000 feet. They include some grand peaks, on which snow is to be seen during most of the year, while the lower spurs are clothed in luxuriant forest, of which a considerable area has been "cleared" and brought under cultivation. Further south these ranges draw together, till, in the Southern Alps, they form a great mountain wall, running from N.E. to S.W., which sends off a number of spurs rising into bold Alpine peaks, and for upwards of 100 miles presents a snowy barrier, crossed last season for the first time, by a pass lying at the head of the Godley Glacier, in the north-east of the district embraced by the map.

To the eastward the Southern Alps send out great buttresses, terminating suddenly in the broad Canterbury and Mackenzie plains, which form, by their absolute flatness, a striking contrast to the peaks behind; while westward the mountains slope rapidly, and in many cases fall in sheer precipices for some thousands of feet to the coast, leaving about 10 miles of comparatively level country between them and the sea.

To the south, in Otago, we find the chain spreading out again from coast to coast in lower hills, amongst which are flourishing farms and

* Map, p. 96.

sheep stations. Amongst the Otago hills lies the beautiful lake district where Lakes Wakitipu, Te Anau, and Wanaka, are backed by Mounts Aspiring, Earnslaw, and other fine Alpine summits, reaching a height of nearly 10,000 feet. This part of the island also includes the now well-known sounds, or fjords, in which several small glaciers are to be found, and round which the mountains tower precipitously to heights ranging from 3000 to 8000 feet. In the south-west corner, below Lake Mani-pori, there is still a fairly large tract marked on the map as "unexplored," into which, however, a party was preparing to force a way last March. With this single exception all the colony has been explored and surveyed, except of course the glacier region in the High Alps, and this has been mapped from sketches and photographs. The Survey Department of the Government has always been noted for its good work, and includes some first-rate men, who have successfully coped with all kinds of difficulties.

The object of this paper, however, is not to give a general sketch of survey work of the island, but to explain to the best of my power the accompanying map, and describe the exploration of which it is a result.

Any account of the pioneer work of a young colony must needs include the doings of men who make such work their profession, as surveyors and prospectors, though there are many instances in the past and present of persons undertaking it more from the pure love of adventure than from any other reason. The smaller glaciers of the Southern Alps (lying north of the larger ones) were visited before those surrounding Mount Cook, owing to the early settlers following the rivers to their sources in the hope of opening up new sheep country, or of finding a pass to the west coast of the island—which in the early days was the subject of much speculation; several attempts were made to force a way over. This was first done in December of 1857, when Mr. Leonard Harper, with four or five Maories, reached the coast over the range, and explored it from Greymouth to Awarua River (since named Haast River), obtaining a good general view of that side of the Alps and some of the glaciers, but not actually visiting any of them. A year or two later (I believe), the glaciers at the head of the Rakaia River were visited by Messrs. Harman and Whitcombe in the course of their survey; and those of the Rangitata, further south, were visited by Messrs. Acland, Chudleigh, and W. Harper.* In addition to this, a great deal of exploring was done among the ranges further south; but as this paper deals chiefly with the Mount Cook Glaciers, it would take too much space to enter into other details.

The first record of any exploration of the larger glaciers is in 1862. It was then that Sir J. von Haast explored the head-waters of the

* See *New Zealand Alpine Journal*, No. I, p. 22.

Godley and Tasman Rivers, proceeding for a short distance on to the ice of the Godley and Classen, at the head of the former river, and of the Mueller, Tasman, and Hooker Glaciers, at the head of the last named.* In 1867 and 1870, Mr. E. P. Sealy made some long expeditions with his camera on these glaciers, in one instance reaching the watershed on the Godley, also penetrating into the upper basins of the Mueller, Hooker, and Tasman Glaciers. From that date, with one exception, there is little to record as far as exploration in this locality is concerned; and it was not till 1882 that we hear of further efforts, when the Rev. W. S. Green, with two Swiss guides, made an almost complete ascent of Mount Cook.†

In 1883, Dr. von Lendenfeldt, from Austria, made a complete exploration of the Tasman Glacier, when he reached the west coast saddle, and ascended the Hochstetter Dome (9258 feet). His experiences and observations are published in German,‡ with his map, which was excellent, though one or two mistakes in detail have since been discovered and rectified. From that date till the present there has been greater activity in this direction, as young New Zealanders began to realise that there was an undeveloped Alpine world equal to that of Switzerland, and that unless some native enterprise was shown, the credit of opening it up would fall to outside men, which would be an everlasting mark of their failure to follow in the footsteps of the early pioneers.

In 1886 Mr. G. E. Mannering set the example, and made an expedition to the Tasman, with little result, owing to his want of knowledge in Alpine work at that time;§ but he has continued every summer to visit the locality in company, on different occasions, with Messrs. M. Dixon, P. Johnson, and Inglis. His efforts were chiefly directed against Mount Cook; and in his repeated attempts on that peak, he did not add much new information as far as the map was concerned, to that already furnished by Mr. Green and von Lendenfeldt; though on one occasion he reached 8000 feet on Mount de la Bèche, thus getting a better general idea of that portion of the Tasman Glacier and its tributaries than had been obtained before. In 1889 the Government sent Mr. Brodrick, a surveyor, to the district. He executed a complete traverse and survey of the Mueller Glacier, and partial traverse and almost complete map of the Hooker Glacier, the latter being correct in all but one important point, which I shall refer to later on. The same season, however, a most important addition was made to our

* For an account of Von Haast's work, see 'The Geology of Canterbury,' by Von Haast, and *New Zealand Alpine Journal*, No. I., p. 14.

† 'The High Alps of New Zealand.' By Rev. W. S. Green (Macmillan & Co.).

‡ 'Der Tasman Gletscher und seine Umgebung,' by von Lendenfeldt. *Petermann's Mitteilungen*, Ergänzungsheft, No. 75.

§ 'With Axe and Rope in the New Zealand Alps.' By G. E. Mannering (Longmans), 1891.

knowledge of the district by the exploration of the Murchison Glacier, lying to the east of the Malte Brun Range, and hitherto unknown beyond the fact that there was a large glacier at the head of that valley.

In January of 1890 Mannering and I, after finding a new pass of no great importance over the southern spur of Mount Cook from the Tasman to the Hooker, at the head of the Ball Glacier, decided on pushing up the Murchison, and exploring the glacier. I must refer to Mr. Mannering's book for a full account of this expedition. The immediate result of our trip was, that the Government sent Mr. Brodrick to survey the Murchison in the following December, which he did thoroughly, proving that our sketch-map was fairly correct, and at the same time completing the topographical survey of the chief glaciers on the east side of the main range.

December, 1890, was notable in our annals chiefly on account of Mannering and Dixon's successful ascent, by Green's route, to within a short distance of the summit of Mount Cook. In that year it was also proved that the map of the Hooker Glacier was incorrect as regards the position of Mount Cook, which had been placed on the main range, but was found to be in fact some little distance on the eastern side, thus sending no water to the west coast at all. This fact was suspected by Mr. Roberts on the West Coast Survey, and was finally settled by Mr. R. Blakiston and myself on our ascent of the saddle at the head of the Hooker Glacier; an ascent which had been tried three or four times by others without success. But for the fact mentioned, and for showing that St. David's Dome (Hicks) was separated from Mount Cook by Mount Dampier (Hector), this ascent was not noticeable for any further discovery.

One point I have been asked to settle from our observations on this climb, is, whether the Balfour Range is not in reality a spur of Mount Hicks instead of being, as shown in the map, an offshoot of Mount Tasman. If this were the case the upper basin of ice, shown on the map as belonging to the La Perouse Glacier, would really be part of the head of the Balfour Glacier. The question is still an open one, for owing to a fog we did not obtain a good view, and we are, I believe, the only persons who have attained a point from which it could be determined.

Last season little was done of importance. Mannering and Lean made a descent from the Godley Saddle to the head of a valley on the west coast, but owing to a mishap were unable to proceed any distance; while on the Tasman, Hamilton and I nearly ascended Mount de la Bèche, but owing to my companion's ill-health, we could not complete the ascent. We, however, overlooked for the first time the watershed at the head of the Rudolf Glacier, seeing the enormous ice and snowfields at the head of the Francis Joseph Glacier.

With the exception of one or two climbs from which no discovery of importance was made, I have now given a fairly exhaustive, though rough, history of the explorations which have helped to make up the map, as now existing, of the glaciers on the eastern side of the watershed.

The amount of work done in the corresponding country on the western slopes of the watershed is not of any great extent, as far as the glaciers are concerned. None of them have been explored; and nearly the whole survey has been filled in from sketches, &c., taken from lower ground by the Survey Officers, under Messrs. Roberts and Douglas, who are well fitted for such exploration—chiefly very rough “bush” work, carried on in an uncertain climate. The west coast is noted for its large rainfall, I believe something like 120 inches being the yearly average, while on the east coast from 25 to 30 inches is nearer the mark. The reason of this apparent want of enterprise on the part of private individuals is, that it takes several days to reach the field of action on the west coast. If one went there with the intention of crossing over to the east coast by a high Alpine pass, there would be no serious loss of time provided the attempt was successful; but any failure would necessitate a return journey along the coast to some practicable pass; and hitherto want of time has been the cause of most of our failures.

For a really successful exploration on either side of the range, a party should be composed of three or four strong men, who do not mind often sleeping in the open air on moraines, and who can afford the time to wait for favourable opportunities; as in most cases hitherto we have pushed on in the face of doubtful weather, in hopes of a change for the better, which has often resulted in an enforced retreat to our base of operations. This not only entails loss of time, but also much waste of power, because finding it difficult and very expensive to procure porters, we have to carry large “swags,” or packs, which sometimes weigh 50 lbs., between one bivouac and another. The party should really be able to afford time for several trips to and fro, in order that a future bivouac may be provisioned and prepared for a stay of several days. Of course in the case of an attempt to push into new country, the whole “swag” must be taken, especially if the party expects to return another way, as in the case of the exploration of the Murchison Glacier, where, thinking we should be able to get over the Malte Brun Range into the Tasman Valley, instead of retracing our steps, we had some 30 or 40 lbs. to carry the whole three days.

I now propose to give a short description of the country delineated on the map, with some interesting measurements taken by Mr. Brodrick, who made the surveys of the eastern glacier system.

The highest point in the Southern Alps is Mount Cook, or Aorangi, as it is sometimes called, which reaches the very respectable height of

12,349 feet, and is practically the centre of the system. It lies approximately in lat. $43^{\circ} 30'$ S., or some little distance nearer the Equator than the Swiss mountains. In spite of this fact, however, the snow-line in this district is about 3000 feet lower than in Switzerland, and the glaciers also come to a lower level. The terminal face of the Tasman Glacier is only 2354 feet above the sea, and the Mueller and Hooker about 2500 and 2882 feet respectively, while on the west coast we find the difference still more marked; for instance, the Fox Glacier comes down as low as 700 feet, and one or two of the others to under 1300 feet, though their terminals are within 10 miles of the sea. The Fox is decidedly interesting, not only as being the lowest of all the glaciers, and, like others on this side, having tree-ferns and bush growing almost on the moraine, and in some cases overhanging the ice, but from the fact that within a very short distance of the terminal face there is a hot spring, with a temperature of over 100° Fahr. This is, I believe, almost unique, and occurs once in the North Island on Mount Ruapehu (9100 feet), where, after climbing some distance on snow and ice to the top, one finds a boiling lake in the crater, into which the ice melts.*

The great glaciers on the east side of the watershed are chiefly flat, hummocky ice, flowing gradually from heights varying from 5300 to 8600 feet. They are covered, roughly speaking, for a quarter of their length with a considerable quantity of surface moraine, formed of detached masses of rock and *débris* of all kinds, with which the Swiss moraines cannot be compared for roughness or extent; it is lifted in heaps or hillocks of 50 feet or more above the general level of the glaciers. The old lateral moraines too are most marked, especially on the Hooker, where five are distinctly visible in some places; while on the Mackenzie plains one rides for upwards of 40 miles through ancient terminal and lateral moraines, showing that at a date comparatively not very distant the glaciers must have been enormous.

The western glaciers, on the other hand, are very different in character, being far steeper, and practically icefalls to within a short distance of their lower ends. They are also almost entirely free from surface moraine, a fact easily accounted for, since the strata in the rocks dip steeply toward this coast, thus presenting a smooth surface on the west, and on the east a broken face, which under the action of weather and climate send down vast masses of *débris* on to the glaciers. Of the upper peaks and ridges comparatively little is known from actual ascents, for owing to difficulty in carrying supplies, and the roughness of the approaches, we have frequently had to return to the head camp because we cannot provide and hold out against bad weather for any number of days, thus losing much valuable time on

* See *Proceedings*, 1885,*p. 272.

the lower ground. This no doubt will soon be remedied, as we are gradually making snug bivouacs in which to stay during the bad weather if necessary, and also owing to the fact that the Government have given us a hut at the junction of the Ball and Tasman Glaciers, which is a capital place for a base of operations.

On the main range the only peak of importance which has been ascended is the Hochstetter Dome (9258 feet). It was first climbed in 1883 by von Lendenfeldt's party, and has since been climbed on two occasions. Also, four saddles have been successfully reached, namely, the Godley Saddle, reached by Sealy, in 1869, and crossed in 1892 by Mannering and Lean for a short distance towards the west coast; the saddle at the head of the Tasman by von Lendenfeldt; that at the head of the Hooker by Blakiston and myself; and on the Mueller, the Burron Saddle, in 1889, by Brodrick's survey party.

Off the main range, a point at 8000 feet has been reached by Brodrick's survey party in 1890, on the Liebig Range; a pass of about 8000 feet, at the head of the Onslow Glacier, on the Malte Brun Range, by Johnson and myself in the same year; and also a point about 7700 feet on Mount Darwin, by Hamilton and myself in 1892. On the Mount Cook Range the main peak of 12,349 feet has been ascended, to within a few feet of the top, by Green in 1882 and Mannering and Dixon in 1890; a pass over the southern arête, at the head of the Ball Glacier, by Mannering and myself in 1889, from the Tasman to the Hooker; and some minor peaks under 7000 feet, to the south of the pass by the survey party and others; on the Sealy Range, Mount Sealy, 8600 feet, has been ascended to about 7900 feet by M. Ross in 1889, and to about 8100 by Johnson and myself in 1890. These represent, roughly, the principal climbs done in this district, and it will be seen that only one peak has actually been conquered. All the others, from Mount Cook downwards, which are mentioned are only partial ascents, the failures of which may be put down to loss of time on the lower ground; bad weather either on the peak or on the glacier causing a retreat from a bivouac to the head camp; and in three cases owing to illness of one of the party, brought on by excessive work in the first place before reaching the scene of actual climbing.

To compare the mountains with the Swiss Alps would be difficult, except in general appearance. Briefly we have, in my opinion, no rock peaks equal to the Matterhorn or Dent Blanche for grandeur, while, on the other hand, I think that in snow peaks in Tasman, Haidinger, Sefton, and Mount Cook, we can more than hold our own, both for beauty and difficulty in climbing; though the latter point is one which has to be proved by actual experiment, as, except Mounts Cook and De la Bêche, none of the loftier peaks have been attempted.

From a scientific point of view our glaciers are very interesting, and I think I cannot do better than make extracts from the Government

Survey report of 1891, which contains the result of Brodrick's observation and survey.*

The glaciers are on the whole receding; in some cases, such as those at the head of the Rangitata River, very rapidly, in others, such as the larger glaciers, more slowly. In the former case, which, so far as we know, is the most marked in this respect, Mr. J. B. Acland gives some interesting measurements, taken at the terminals of the Clyde Glacier. In 1866 the altitude at the terminal face was 3233 feet, and the point where the clear ice was lost in the surface moraine was 1057 feet higher. The next year this point was 980 feet above the terminal, and in 1871 only 725 feet, thus showing a shrinkage of 305 feet in altitude in five years between the two points. In 1880 he again visited the locality, but took no measurements, but reports that the shrinkage was very evident.†

The very marked moraine heaps, which must have been terminal moraines at no very distant date, are further evidence of shrinkage; and these exist in great numbers in the neighbourhood of the Tasman and Hooker Glaciers. The Mueller Glacier, however, is so erratic, that it is hard to say whether it may not be advancing. Last year it pushed forwards several yards, damming up the Hooker River; and meeting great resistance, its terminal face was thrown up into enormous hummocks and pinnacles of 200 feet. The Ball Glacier has advanced also very noticeably in the last few years.

Mr. Brodrick's observations and report give the following results as to the size, extent, and motion of the four chief glaciers—namely, those on the eastern side of the range—in the accompanying map.

Name.	Area.	Length.	Average Width.	Greatest Width.	Narrowest Width.
	Acres.	Mls. Chns.	Mls. Chns.	Mls. Chns.	Mls. Chns.
Tasman	13,664	18 0	1 15	2 14	0 60
Murchison . . .	5,800	11 0	0 66 $\frac{7}{10}$	1 5	0 42
Mueller	3,200	8 0	0 50	0 61	0 37
Hooker	2,416	7 25	0 41 $\frac{3}{10}$	0 54	0 30

He also adds the Godley and Classen, which, as I have said, lie to the north-east of the district included in the map, and are at the head of the Godley River and Lake Tekapo.

	Acres.	Length.	Average Width.
Godley	5,312	8 miles.	1 mile 3 chains.
Classen	1,707	4 miles 70 chains.	43 $\frac{1}{2}$ chains.

* 'Reports of the Survey Department, New Zealand,' 1888-89, 1889-90, 1890-91. Survey Office, Wellington, N.Z.

† See *New Zealand Alpine Journal*, No. I, p. 22.

These figures show that our glaciers exceed in extent those of Switzerland, the Aletsch being only 15 miles long by nearly 1 mile broad.

In estimating the rates of motion, Mr. Brodrick set rods in a line across the glacier, taking fixed points on the two sides, allowing a certain time to elapse before noting the alteration, and then taking an average per day. On the Tasman, one line extended across from near the inflow of the Ball Glacier, 8 rods being set on December 5th, 1889, and re-set again on January 7th, 1890, showing the following result:—

Station 1	Total Movement.	Daily Rate.
2	27.2 feet.	9.9 inches.
3	41.0 "	14.9 "
4	47.7 "	17.3 "
5	48.4 "	17.6 "
6	49.6 "	18.0 "
7	46.9 "	17.0 "
8	44.2 "	16.1 "
8	38.3 "	13.9 "

The other line taken was from the point of the spur running down from Malte Brun Range, on the northern side of the mouth of the Murchison Valley, being set and re-set on the same dates. The measurements were taken from nine points, showing respectively the following results in total movement:—6.5 feet, 25.9 feet, 28.7 feet, 32.7 feet, 36.6 feet, 33.7 feet, 34.4 feet, 29 feet, 25.4 feet, 13.9 feet; while the average daily rate is easy to calculate, ranging from 2.4 inches to 13.3 inches, and down again to 5 inches. On the Murchison he observed a set of rods across from the Dixon Glacier, showing an average daily rate, calculated from 48 hours' observation, of 0.5 inch, 3.5 inches, 8.0 inches, 8.7 inches, 7 inches, 4.5 inches, and 2.6 inches respectively at the different rods.

The Hooker, contrary to the opinion of those who have traversed it, shows very little motion, which is peculiar, because the head ice is steep when compared to the others, and it descends about 6000 feet in $7\frac{1}{4}$ miles. The figures given were determined in the same manner after a lapse of three days from taking the first line. The average daily rate is, for the 5 rods:—1.1 inch, 2.9 inches, 4.2 inches, 5.4 inches, 4.5 inches respectively.

The Mueller was subjected to a much more trustworthy test, as the first line was taken on March 29th, 1889, and on November 14th, 1890, thus allowing two winters and one summer to elapse, while the others, as will be seen, were only summer motion. Eleven fixed points show the following result as to average daily rate:—4.8 inches, 5.5 inches, 5.8 inches, 7.3 inches, 8 inches, 12.3 inches, 10.2 inches, 8.2 inches, 7.8 inches, 2.9 inches.

In finishing his report, which I have quoted less than I should have wished, Mr. Brodrick says: "I have now been over all the most

important glaciers of Canterbury, and a great many of the smaller ones as well, but I should say that the Murchison, for reasons I shall try to enumerate, is the best field for scientific research. To begin with, its moraine is composed of different-coloured stones lying in sections. . . . From the many views I have had of the glacier from different points on the surrounding hills, I have always been able to distinguish this feature; . . . the large medial moraine is smoother than any I have seen on other glaciers, and for some distance a horse might be ridden along it. The height is from 60 to 90 feet, and the stones are in general small. The general appearance of a section would be like that of a formed road—that is, a gradual rise to and a slightly flattened crown.

“Between this moraine and the spur north of the Dixon Glacier a large surface stream runs, finding its way under the glacier, but by no fixed opening. . . . It is swift, and many perfectly water-worn stones are in its bed.

“Water-worn stones are to be found throughout the whole length of the main moraine, but, so far as I could see, only on the eastern side. To get from the bed of the creek to the place I have indicated the stones would have to be lifted about 100 feet; yet I believe that is the place they came from, and I think the Dixon Glacier in some manner pushes the ice up.”

Of the tributary glaciers he says the Baker and Dixon are advancing decidedly, while the Wheeler and Cascade are dying out. The two former have a peculiar ice formation, having lateral ridges of ice very steep, and rising some 40 feet above the level of the rest of the glacier. In one place, taking a point on the ice ridge of the Baker, he says: “About 70 feet below it is a new lateral moraine in course of formation; this is gradually merged in the ice ridge. Below this is a hollow, and then at the bottom of the spur, and following it round, comes another small grass-covered moraine, showing that at one time the surface level of the glacier was about 200 feet lower than it is now; while three old moraines parallel to the glacier on the spur to the north point to the fact that it has also been much higher. These signs of constant change are visible near many of the other glaciers, but the Baker is the best example.”

Not having much knowledge of botany, I shall not attempt to describe accurately the flora of the New Zealand Alps. It is not so varied as the Swiss, but it makes up in quality what it lacks in variety. There are four or five kinds of ranunculus, including the beautiful *Ranunculus lyalli*, which is to be met with in great quantities, growing practically everywhere in the neighbourhood of the glaciers; celmisias are also very common, in both small and large varieties. Numerous other flowers, of more interest than beauty, are to be found on the moraines and hillsides; while a form of edelweiss, varying but slightly from the Swiss, is to be seen above 3000 feet, and I have found it

as high as 6000 feet on the Malte Brun in great profusion. The "scrub," growing to the height of 6 or 8 feet, is very dense, and is composed of various shrubs, which are no doubt as interesting to the botanist as they are troublesome to the explorer—at least, I hope so. It grows, generally speaking, up to an altitude of 4000 feet, gradually becoming more stunted until it disappears. Above this we find flowers and smaller plants, and I think I am right in saying that in the New Zealand Alps no vegetation has been found higher than 6500 feet. Personally, I have not seen it grow higher than 6200 feet.

Birds are not very common on the glaciers—that is to say, in variety; for we see great numbers of the kea, or mountain parrot, which sometimes kills sheep in the lower country, but is a tame, amusing, and very inquisitive visitor in a mountain bivouac. The glacier wren is found, as a rule, far up the ice; he is very small—not unlike a small sparrow, with no tail and long legs, is very tame, and lives chiefly on the spiders which infest the moraines. Kakas and wekas are also common, the latter being a wingless bird, known all over the colony as an incorrigible thief, stealing anything he can move from a camp. I cannot do better than refer those interested in ornithology to Sir W. Buller's 'Birds of New Zealand.'

Black spiders are very frequently seen in great quantities on the moraines. I have seen one on a small island of moraine surrounded by at least half a mile of ice. Insects, such as moths, butterflies, and whetas are very numerous in some parts, where one would not expect to see them, notably on the comparatively small "corner" of moraine at the foot of De la Bèche, which is surrounded by ice and snow. The last-named, the wheta, is a kind of grasshopper in appearance, and is common to the whole of New Zealand; but Mannering, on the Mount Haast spur, and myself, on De la Bèche, have found small black whetas high up on the snow-fields. These are rare at present, only a few specimens having been obtained about the size of an English grasshopper, and quite black, whereas the ordinary wheta is of many colours and has been found, measuring, I believe, 2 or 3 inches in length, in other parts of the colony.

To conclude, I can recommend the New Zealand Alps to all who are fond of natural research; they offer, in many respects, a new and interesting field.

MAP.—The Map of the Southern Alps of New Zealand has been compiled from the Government Surveys. Corrections were made of the Hooker Tasman and Murchison Glaciers by A. P. Harper.

LIEUTENANT RYDER'S EAST GREENLAND EXPEDITION, 1891-92.*

THE last number of the *Geografisk Tidsskrift* of the Danish Geographical Society contains a full account of the East Greenland Expedition of 1891-92 (see *Proceedings*, p. 711), in the form of letters from Lieutenant Ryder. The first of these was written on board the *Hekla*, in the ice in lat. $72^{\circ} 26' N.$, long. $9^{\circ} 56' W.$, and the others, written in February and June, 1892, are dated from the winter quarters of the expedition in $70^{\circ} 27' N.$, and $26^{\circ} 11' W.$

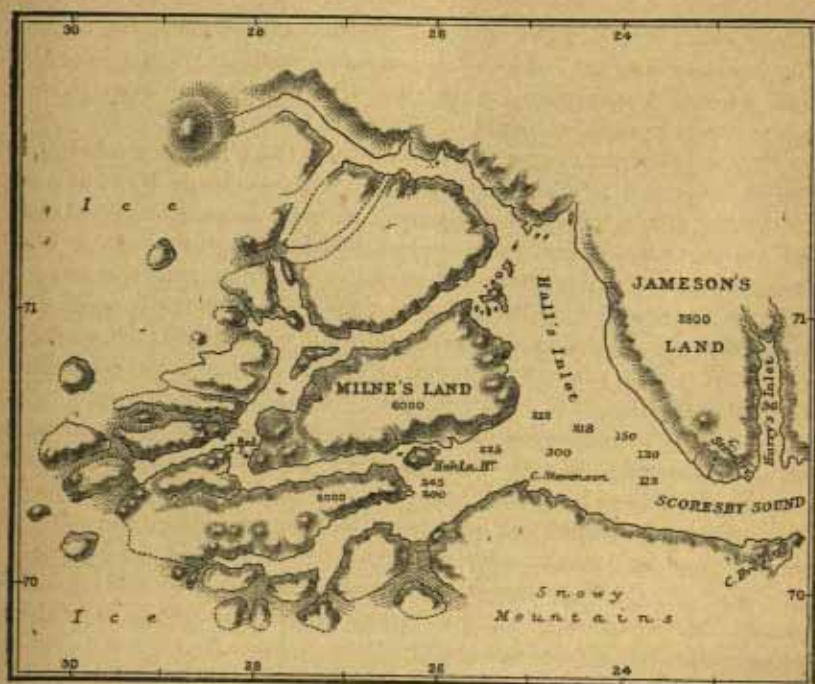
The *Hekla* had great difficulty in effecting a landing on the Greenland coast. Leaving Copenhagen on June 7th, 1891, she met the outer edge of the ice thirteen days later in lat. $68^{\circ} 12' N.$ and long. $13^{\circ} 5' W.$, 220 miles east-south-east of Cape Brewster. But there was no possibility of making way through the ice, and the expedition steamed northwards as far as $76^{\circ} 13' N.$ There the somewhat more open character of the floes raised the hopes of the commander, and he entered the ice. But it was 33 days before the *Hekla* overcame the difficulties offered by pack-ice and fog, and entered Scoresby Sound. Only one landing could be made during this month; this was off Cape Broer Ruys, on the south of the little Holland Island, a fringe of solid ice 5 miles wide having been crossed on sledges. Altogether the year was very unfavourable, and even Jan Mayen, which is usually ice free, was surrounded for about 60 miles by the ice-pack. The width of the floating ice-fields in the east of Greenland attained 300 miles at $68^{\circ} N.$, 380 miles at $72^{\circ} N.$, 360 miles at $74^{\circ} N.$, and 300 miles at $76^{\circ} N.$ Under such unfavourable circumstances the members of the expedition considered themselves fortunate in reaching the entrance of Scoresby Sound on August 2nd.

When the *Hekla* steamed westwards in Scoresby Sound it soon became apparent that the great fjord divided into several branches which stretched far inland. The *Hekla* entered the south-western branch of the fjord, in the hope that it might be an inlet leading to Scoresby's Knighton Bay. Near the entrance of this branch an excellent spot for a winter station was found on the coast of an island named Denmark Island, and situated to the south of Milne's Land; and when a renewed attempt at erecting the winter station at Cape Stewart proved unsuccessful—the whole coast being thickly wrapped in ice—it was decided to stay there for winter quarters. On August 23rd the *Hekla* was brought to her winter station.

Various boat expeditions, partly in the steam launch and partly in rowing boats, were made until September 25th, the result being that 3060 square miles were laid down, and the great interior ramifications

* Revised with additions for *The Geographical Journal* by Lieutenant Ryder.

of Scoresby Sound were explored and mapped. It appeared from these explorations that the Hurry's Inlet, between Jameson's Land and Liverpool Coast, is not an inlet connecting Scoresby Sound with Davy Sound—as supposed by Scoresby—but only a fjord 28 miles long. It has in the east the steep crags of Liverpool Coast, rising to a height of 3000 feet, and seemingly composed of gneiss. Towards the west rise the 2500-foot-high crags of Jameson's Land, which are considered by the explorers as an immense moraine of the glacial age. Many fossils, both animals and plants, belonging to the Jurassic and to Tertiary periods, were collected there.



SKETCH OF THE INNER BRANCHES OF SCORESBY SOUND, BY LIEUT. C. RYDER,
ROYAL DANISH MARINE, 1892.

(Scale 50 miles = 1 inch. Soundings in fathoms. Heights in feet.)

At Cape Brewster, where fossils from a period older than the Jurassic have been found, the crags are but from 300 to 500 feet high, and the coast is covered with moraines. It has a relatively rich vegetation, and on standing here one almost forgets that he is in a polar region. On the contrary, the southern shore of Scoresby Sound is a high unindented basalt wall, 60 miles long, covered with small secondary glaciers, which are reconstructed on the slopes out of *débris* of the ice, which falls in cascades from the upper plateau. The interior ice attains a height of about 6000 feet.

The ramifications of the tributary fjords appear in Lieutenant Ryder's map, which we reproduce.

The edge of the inland ice, which is 176 miles distant from the sea at Liverpool Coast, is seen at the heads of the smaller bays of the fjords.

It appears certain that all the fjords reach the inland ice. The heights of the icebergs from the northern glaciers in Hall's Inlet have been measured up to 300 feet above the water surface. Two of the largest icebergs which have been measured have been found to have lengths of respectively 6000 and 3000 feet, and widths attaining 2000 and 3000 feet. The gneiss, which is covered by basalt in the western sounds attains a thickness of 500 feet in the south-west, 3000 feet in Milne's Land, and 6000 feet in the northern part of the explored region. Moraines, glacial striæ, and *roches moutonnées*, testifying to a previously much greater extension of ice, are met with everywhere, even on the tops of the plateaus at a height of 4330 feet.

Animal life is rich, especially in Jameson's Land, where reindeer are seen in wonderful numbers. They also are numerous on the coasts of the interior fjords. Many musk-oxen were seen around Hurry's Inlet, and traces of foxes, hares, bears, ermines, and lemmings were observed in Jameson's Land. The richness of vegetation (150 flowering plants were gathered in Scoresby Sound), and the size attained by it, especially around the western basin, is most astonishing, especially in comparison with what it is on the western coast, or a little further north, where the snowfall is smaller.

No human beings were seen, but numerous winter houses, graves, &c., now abandoned, testify that the fjords were recently inhabited by a relatively numerous Eskimo population. The average temperatures observed were, in Fahrenheit degrees:—October, 19°; November, -4.4°; December, -4.5°; January, -1.5°; February, -11.6°; March, -14°; April, 1.1°; May, 22.8°; the lowest observed minimum being -52° 2. Severe föhn storms, one of which suddenly raised the temperature to 52° Fahr., were experienced in May and the first days of June.

As soon as spring came, sledge journeys were begun, and the exploration of the fjords was continued. No sickness occurred amongst the members of the expedition during the entire time.

In 1891 the winter-ice in the interior of Scoresby Sound had broken up so early that only very little was to be seen when the *Hekla* in August first entered the fjord; in 1892 quite the contrary took place. It was impossible for the ship to get out of the harbour before August 8th; and even at this late date it was with much difficulty that the passage out of the fjord was made, the winter-ice lying in large unbroken masses in the whole of the inner part of the fjord west of Cape Hooker. After a short visit to Cape Stewart, the expedition left Scoresby Sound on August 13th, and proceeded southward along the coast. From Cape Brewster to 69° N. the ice offered no difficulty, but

at the latter point firm unbroken land-ice was met with, which could not be passed either by the ship or with boats. The *Hekla* therefore returned northwards, and got out of the ice on August 18th in $68^{\circ} 25' N.$, $19^{\circ} 25' W.$ A short visit was made to Iceland for the purpose of coaling and taking in provisions; and on August 29th the *Hekla* again left for Greenland, the intention being to try to reach the coast at Cape Grinel and follow it southward to Angmagsalik, but constant easterly storms and packed ice made this impossible. On September 10th the coast was reached at Angmagsalik ($65^{\circ} 40' N.$), the wintering place of Captain Holm. While the ship was anchored in a bay here the expedition made boat excursions northward to $66^{\circ} N.$ The ice, here lying packed close to the land, prevented further progress, and it was too late in the season to await a spreading of the ice. All the inhabited places in the district were visited. During the eight years that had elapsed since the visit of Captain Holm the population had decreased from 400 to 300 souls. A very large collection of dresses, weapons, and utensils was purchased from the Eskimo.

On the 26th of September the *Hekla* left the harbour, and after a fine voyage arrived at Copenhagen on October 12th.

PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDES.

By CLINTON DENT, F.R.C.S.

MR. CLINTON DENT, F.R.C.S., sends the following communication, which is a summary of an article published in the *Nineteenth Century* for September last, with additions suggested by Mr. W. M. Conway's recent experiences in the Karakoram:—
“Mountaineering as a special branch of travel has developed so much within the last thirty years, that the oft-discussed question as to the possibility of ascending the highest points of the Earth on foot has assumed a new phase. Probably, as far as practical skill is concerned, mountaineers of the present day are fully qualified to make the experiment. The question is whether the feat is a physiological possibility. The intrinsic ‘mountaineering’ difficulties are not likely to be insuperable. Assuming that Gaurisankar is really the highest point, it is probable that on the north side the snow slopes will be tolerably gentle. Days must occur, though they might be exceptional, when the snow would be in good order, and not powdery or granular. At the same time, the extremes of heat and cold experienced render it likely that extensive ice-slopes will be met with. Time would prevent any great length of ascent by step-cutting, and success would only be possible when snow overlying the ice was yet

adherent, and in good order for walking. It is tolerably clear that the use of climbing-irons may be essential. Although Mr. Conway's guide, Zurbriggen, cut an immense series of steps, they were not fully fashioned, as would be necessary if no climbing-irons were employed. 'A stroke or two' sufficed. Mr. Whympcr's observations are of great interest and importance, but the Andes is not the most favourable field for testing the upward limit of mountaineering. A long sea voyage is necessary; the climate is trying, and the weather abominable. Experience seems to show that great heights can be reached in the Himalaya with less distress than in the Andes. Apparently also they can be reached with less difficulty in Sikkim than in Central Asia. Professor Bert and Mr. Whympcr have demonstrated irrefutably that mountain sickness is a real affection. Professor Bert sees in the deficiency of oxygen at great heights the explanation of all the symptoms. Mr. Whympcr does not share this opinion, and shows conclusively that Bert's suggested remedy, the inhalation of oxygen, is not practically possible on the mountain-side. Mr. Conway's experience at a height of 23,000 feet (?) seems entirely opposed to Professor Bert's theory. Mr. Whympcr regards the expansion of the air or gas within the body and the consequent pressure upon the internal organs, as an important factor; but considers that this may be minimised, or even entirely avoided, by gradual ascent. In the writer's opinion, the mechanical effects of such expansion of air or gas are unlikely to prove at all a serious obstacle. A far more important factor is the effect of diminished pressure on the portion of the spinal cord concerned with the nutrition of the lower limbs. This effect is brought about through interference with the local blood-vessels. Greatly increased pressure also produces much the same symptoms. The circulation of the blood is much impeded through the portion of the spinal cord where it is most demanded while the lower limbs are being exerted. The result is, that the action of walking, which should be almost 'automatic,' at great heights demands a powerful effort. Hence follows fatigue. Recovery can take place, but only very gradually. Mr. Conway took sphygmographic tracings of his own and his guide's pulse at the greatest height he reached. These tracings will probably bear out what has often been noticed before, that the blood has great difficulty in reaching the extremities. Presumably the tracings were of the pulse at the wrist. Comparative tracings of the pulse in an artery such as the carotid in the neck would have been of great value, and such may have been taken. For the turbulent action of the heart and consequent distress might then be shown to be due to efforts to overcome the peripheral resistance rather than to any affection of the heart itself. Certain blood-vessels have to enlarge, and this is a slow process. The increased frequency of the heart's action is due to peripheral resistance. It would appear, as regards the effects due to expansion within the body of gases

as well as to the nutrition effects, that complete recovery and entire habituation to low pressure can take place. Mr. Whympers dictum, that, in the endeavour to ascend to the greatest heights, 'from the effects of respiration none can escape,' is discussed in the article referred to. Inspiration being a muscular act, the question is, how far the special muscles involved may be trained to extreme and protracted exertion. Actual experiment can alone furnish the full answer. Physiological considerations seem to indicate that in exceptional men the required increase of sustained muscular power could be fully met. In men and animals who remain for some time under conditions of greatly reduced pressure the number of coloured blood corpuscles, the essential oxygen-carriers, increases prodigiously. It is thus apparent that the oxidations of the body may be carried on after a time effectively at great heights. Those who would attempt the experiment must be physically qualified. Anæmic persons are unsuitable. Tolerably full-blooded men, of spare habit, with relatively large bones, will probably suit best. The experience of the workmen recently engaged in the construction of a railway tunnel in Peru, at a height of 15,645 feet, shows that in a period to be measured by weeks, occasionally months, acclimatisation becomes so complete that the individuals are capable of doing full work. The climatic conditions are so much more unfavourable in Peru than in the Himalaya, that it is not unfair to assume that work at a height of 20,000 feet in the latter would not demand greater exertion than at a height of 16,000 in the former. Neither on mountaineering nor on physiological grounds does the possibility of ascending Gaurisankar appear hopeless. To some extent a question of men, it is largely a question of money. Selected men will have to work for a year or more with the one definite object before them if they desire to ascend 6000 or 7000 feet higher than has yet been reached on foot. The attempt would be costly, long, laborious, and not free from risk; but it is possible. The cold due to the diminished circulation through the lower limbs appears to be a more serious factor than has hitherto been imagined. Although the heat of the sun was terrible in Mr. Conway's recent ascent of the Pioneer Peak, 'the cold ground seemed to suck the warmth out of our feet' (*Proceedings*, 1892, p. 763), and the party narrowly escaped frost-bite. Wearing metal climbing irons may have conduced to loss of heat; but it is plain that the best covering for the feet and legs for very high ascents requires special and further consideration. The experience of Arctic travellers will be of value; but it must be remembered that Arctic travellers are not subject to the same interference with the circulation due to the diminished pressure. Certain drugs have the power of relaxing the smaller blood-vessels, and it is possible that these might be of use."

PHYSICAL EXPLORATION OF THE BLACK SEA.

By N. ANDRUSOFF.*

THE hydrographical explorations which were made in the Black Sea in 1890 and 1891 on board the warships *Chernomorets*, *Zaporozhets*, and *Donets*, and the schooner *Kazbek*, have already been referred to in the *Proceedings*.† We have accordingly selected from the very interesting general summary of these researches by N. Andrusoff those portions which supplement our previous notices.

The Configuration of the Bed of the Black Sea is very simple, and its main features are shown on the accompanying sketch-map. The 100-fathom line follows the coast closely, except in the north-west part of the sea, where it runs from Varna to the south of the Crimea with a slight inflexion towards the north. From this line the bottom sinks with a relatively steep gradient (of nearly 12°) to a depth of 800 fathoms, and then it slowly sinks to the 1200-fathom line which encloses an oval area in the central part of the sea. The maximum depths of 1219 and 1227 fathoms have been reached within this oval.

On the surface, the Salinity of the water is very small, so that it may be described as brackish. Its density varies from 1.01206 to 1.01372, gradually increasing to 1.01678 at the depth of 100 fathoms, and to 1.01721 at 900 fathoms.

The distribution of Temperature is most remarkable. The upper layer, about 25 fathoms thick, varies in warmth with the seasons. Below it, a layer of colder water (about 44° Fahr.) has been found in July, and from this layer downwards the temperature gradually rises till a depth of 100 fathoms is reached. Below this level, the whole mass of water has a constant temperature of 48° . The cold layer changes its position, and sinks lower down in August (35 to 50 fathoms), so that it is supposed to represent nothing but the layer of superficial water, cooled during the winter, which gradually sinks during the spring, summer, and autumn. But its sinking soon finds a limit when it meets the denser and saltier water, which an under-current has been proved to bring from the Mediterranean through the Bosphorus. The vertical circulation of water is thus limited to the upper 100 fathoms or so, and the transmission of heat further down is effected exclusively by conduction through the water itself which acts only to a very slight extent. The distribution of temperature in May and August is shown in the two diagrams, Figs. 1 and 2, accompanying the map. Dissolved air must also be transmitted to the lower layers by diffusion only.

The lower layers contain, as is known, a great amount of dissolved sulphuretted hydrogen,‡ and also sulphides of alkaline and earthy metals, while the total amount of dissolved gases is smaller in great depths than it is in the upper layers. This fact seems to imply that the deep-sea water suffers at the same time from a deficiency of dissolved oxygen, which renders it quite uninhabitable for plants and animals.

The coarse Sediments (littoral deposits) are limited to a very narrow zone along the coasts, and it is only in the north-west that sand covers extensive parts of the bottom. As a rule, a sandy bottom is limited to a depth of from 10 to 20 fathoms, and it is only opposite the Bosphorus that gravel and sand are found so deep as 50 fathoms. Mud prevails elsewhere. Down to the 100-fathom line it is of a light

* Summary of a paper read in German at the Edinburgh Meeting of the British Association, 1892. Map and diagrams, p. 96.

† 1890, p. 171; 1892, p. 122 and 461.

‡ See *Proceedings*, 1892, p. 462.

grey colour, and contains an astonishing number of thin shells of *Modiola*. On the steep slope of the bottom (100 to 800 fathoms) the mud is dark, but at once becomes grey in the air, owing to the oxidation of the hydrated iron sulphide which it contains. At still greater depths it acquires a light-bluish colour owing to the abundance of carbonate of lime. In all samples obtained from great depths only foraminifera and littoral diatoms were seen. On the contrary, micro-organisms of pelagic origin are very numerous. It is most interesting also that the pollen of conifers is always found in the deep-sea mud. The succession of the various classes of deposit is shown on the profile, Fig. 3, accompanying the map.

Organic Life is, as known, limited to the upper layer of 100 fathoms; at greater depths there is no life whatever.* The *Modiola* ooze zone (20-100 fathoms) is distinguished by a poor but characteristic fauna. Thin, evenly-coloured molluscs (*Modiola phaseolina*, Phil.; *Scrobicularia alba*, Wood; *Cardium fasciatum*, Mont.; *Cerithium pusillum*, Jeffr.; *Trophon brevium*, Jeffr.; *Bulla truncata*, Mont.), numerous common Ascidians, Annelids, very small Ophiuroids (*Amphiura florifera* Forb.), small *Synapta* and *Cerianthus vestitus* are the chief representatives of it. The pelagic life of the Black Sea differs from that of the littoral part of the same by its greater richness in pelagic diatoms, little Ctenophores (*Cydippe*), Sagittæ, and large Copepods, as well as by a scarcity of littoral larvæ. From depths of about 200 fathoms only dead diatoms and thrown-off joints of Copepods could be obtained.

One of the most interesting finds was the discovery in the ooze, at depths of from 100 to 600 fathoms, of remains of Caspian brackish water mussels, such as *Dreissena*, *Cardium* (*Monodonta*), *Micromelania*, *Neritina*, and *Clessinia*. Some of them proved to be varieties of species still living in the estuaries of the South Russian rivers which enter the Black Sea, while the others belong to species no longer found in the Black Sea but still living in the Caspian. "This fact, as also the regularity of their distribution and the impossibility of admitting that they may have been carried by the currents or the waves to this depth (where in any case they could not live, the density of water being over 1·01617, while in the Caspian it is only 1·01125), compel us to assume that by the end of the Pliocene epoch, and probably also at the beginning of the Quaternary period, the Black Sea was a great brackish lake whose fauna was similar to that of the Caspian. A communication with the Mediterranean did not exist at that time, and, as is shown by the beautiful researches of Neumayr, land occupied the place of the *Ægean Sea*." The Bosphorus was probably pierced by the end of the Glacial period, and it gave access into the Black Sea to a Mediterranean fauna.

The access of the very salt Mediterranean water and its accumulation in the deeper parts of the sea is what prevented the vertical circulation of water, and indirectly led to an accumulation of sulphuretted hydrogen in the lowest layers. The former inhabitants of the great depths disappeared in consequence of the greater salinity of the intruded water, while the small depth of the Bosphorus prevented the immigration of new deep-sea forms. The great number of organisms which died in consequence of the change led to the formation of sulphuretted hydrogen, and vertical circulation in water having been rendered impossible, the gas remained dissolved in large quantities in the lowest layers. The supply of sulphuretted hydrogen is still maintained by the decayed vegetable organisms carried by the rivers as well as by the decaying organisms of the superficial layer whose remains are not destroyed in the Black Sea by deep-water forms of life, as they are destroyed in the ocean, and are not oxidised in consequence of the greatly-reduced proportion of oxygen, which is

* *Proceedings*, 1892, p. 461.

characteristic of the great depths of this closed basin. The analysis of the gases contained in the samples of water which were taken from different depths will give more reliable data to test the probability of the above suggestions. Meanwhile the curve, Fig. 4, accompanying the map shows approximately the rate of increase of sulphuretted hydrogen with depth.

CHITRAL.

CHITRAL or Kashkar, to which public attention is at present directed, in consequence of the exciting events that have ensued on the death of Aman-ul-Mulk, the former Mehtar or ruler of the state, is a petty state situated on the southern slopes of the Hindu Kush Mountains, amid spurs whose peaks range from 14,000 to 25,000 feet in height. It lies about 150 miles from Gilgit, our nearest military station, and about 200 miles from Peshawar, at an average altitude of 5200 feet above the sea. To the northwards Chitral territory extends at least to the crest of the Hindu Kush range, and southwards it includes the valleys of the Kunar River and a few tributaries. On the extreme south it is bounded by the petty states of Asmar and Dir, the main valley above these limits being reputed to be of extraordinary fertility.

There is little level ground throughout the district, and the people build their villages on the ridges and slopes of the mountains, and there till the land available for cultivation.

Chitral itself comprises six large villages, extending for 3 miles along both sides of the Kunar or Kashkar River, at a point where the valley widens suddenly and the landscape undergoes a complete change, the mountains becoming thickly clad with pine forest. The climate is similar to that of Kashmir, with heavy and frequent rainfalls. The same feature is observable eastward of Chitral and along the watershed between the Gilgit and Indus rivers, which separates two very dissimilar regions, one comparatively arid and the other with abundant rainfall.

On the right bank is the fort in which the Mehtar or Badshah resides. The population subject to him number between 150,000 and 200,000 souls, an estimate which does not include the Bushgali Kafirs, who are tributary, or the subjects of the Yassin ruler. Chitral has been at different times tributary to Badakhshan, Afghanistan, and Kashmir, and the late Mehtar, according to Major Biddulph, paid in 1889 a tribute of horses, hawks and hounds to the Maharajah of the last-named State. For some few years past a native agent of the British Government has resided at Chitral.

Major Biddulph says that the population of Chitral is a curious and intricate ethnological puzzle. The largest section of the population are the Kho, who inhabit the whole of Kashkar Bala, the Ludkho, and Arkari Valleys, and the main valley down to Darosh (Drúsh of

Raverty), and have penetrated eastwards as far as Chashi. They call the country also Kho, dividing it into different sections, under the names *Turikho* (upper), *Mulkho* (middle), and *Ludkho* (great), while the language is styled Kho-war. This is the language given by Dr. Leitner under the name Arnyia, by which it is known to the Shins of Gilgit. In sound it is soft and musical, and a vocabulary and grammar are appended by Major Biddulph to his book.*

Biddulph estimates that Chitral can collect about 6000 fighting men, if not more, and Raverty remarks that they are said to be excellent marksmen, and powder and lead being exceedingly scarce to be very careful in aiming.

The principal routes in the country are (1) from Jelalabad or Peshawar to Yarkand, and (2) from Chitral *via* Mastuj and Yassin to Gilgit. By the Tui pass Mastuj can be reached in five days, but the pass is 16,000 feet, and difficult, and can be used only in summer. Another, and longer, though easier route, crosses the Shandur plateau, which is about 12,000 feet above sea-level, and forms the watershed between the Gilgit and Laspur rivers. It is open to traffic of all kinds throughout the year. To the north, there are numerous passes which lead from Chitral territory over the Hindu Kush range into the Valley of the Oxus, and it is the existence of these that invests Chitral with considerable strategic importance.

The best known pass is that usually called by English writers Barogil (12,000 feet above sea-level), though it appears that that name is more correctly applied to the plain. Raverty calls it the Palpi Sang Pass, and Pilpi Sung is marked in the Surveyor-General's "map of the Punjab and neighbouring countries" (Calcutta, 1854), though too far west. Muhammad Amin says it is practicable for laden carts, though for three months it is closed by snow. Then follow, proceeding westwards, the Ochili, Rich, Ishtragh, Khatira'h or Kharteza, Nuksan, Agram, Dora or Do Rahah and Apaluk Passes. East of the last is the lofty peak called Tiraj Mir or Tirich Mir, 25,426 feet in height (according to Col. Tanner), a magnificent mountain which fills the whole landscape as one looks northward from Chitral, and is also visible from the Oxus Valley. Both the Nuksan and Do Rahah Passes were crossed by the Havildar, the one in September and the other in November, and their difficulties certainly appear to justify the meanings of the two words as given by Raverty.

The Apaluk Pass is scarcely known by geographers, though it appears as "Ebauluk" on the Calcutta map mentioned above, and Colonel Tanner says he heard of the name in the course of his explorations. Raverty says it is a very important pass, strategically considered, and leads from Badakhshan *via* Lut-Dih, and Harandu to Jelalabad.

* 'The Tribes of the Hindoo Koosh.' Calcutta, 1880.

The Shui and Thuret passes lead into Kafiristan across the lofty spurs which flank Chitral on the west.

The chief authorities on Chitral are Moorcroft, the Pandit Manphul, Muhammad Amin, Faiz Buksh, Major Raverty (J. A. S. B. for 1862 and 1864, and 'Notes on Afghanistan,' pp. 152-163), the "Havildar" (Journal R. G. S., Vol. XLII., 1872), the "Mullah" (Report on the Trans-Himalayan explorations, 1873-1875), and Biddulph in his 'Tribes of the Hindoo-Koosh.' Besides the last-named author (who, it may be mentioned, collected a valuable series of forty-six routes about Gilgit and the surrounding hill-country), the late Mr. McNair, Mr. Ney Elias, Sir William Lockhart, Colonel Durand, Dr. Robertson, and Mr. Kitchen have all visited Chitral in recent years. The best map of Chitral is the "Map of the Upper Oxus Valley," in two sheets, by Mr. J. B. N. Hennessey, on the scale of 12 miles to the inch. It embodies Mr. McNair's work.

TREATY-MAKING IN AFRICA.*

By Captain F. D. LUGARD.

GEOGRAPHY has lately, I understand, been defined as the description of all that relates to the Earth's surface, and so it includes to some extent ethnology and the customs and habits of tribes and nations.

We hold a written bond "in black and white" to be a sacred thing, binding in a peculiar way on those who deliberately sign it. But this is a civilised idea, foreign to and in no way understood by the savage. There exists in Africa, however, a parallel institution, and when I learnt its significance it seemed to me that I had found the nearest equivalent possible to our idea of a contract. This is the ceremony of blood brotherhood, and it is held in Africa among the most savage and uncivilised tribes as the most solemn and binding of contracts. The rite is performed in various ways, always with the utmost solemnity and *empressment*.

Treaty-making occupies a large place in most modern works of African travel, and since there are different methods of treaty-making,—I have known a valuable concession purchased by the present of an old pair of boots,—I am anxious to explain to geographers the proper procedure followed by responsible and duly-accredited diplomats in that Continent. I must pass over the description of the various modes in which blood brotherhood is concluded, and speak only of the general idea which pervades the contract. Seated cross-legged on a mat opposite to each other on the ground, you should picture a savage chief

* Introduced by Captain Lugard at the second reading of his paper, on his travels in the Uganda region (see *Proceedings* for 1892, p. 817), November 24, 1892.

in his best turn-out, which consists probably of his weapons of war, different chalk colourings on his face, a piece of the skin of a leopard, wild cat, sheep or ox—*et preterea nihil*; and facing him myself in a costume which at times would make the fortune of a crossing-sweeper. The chief's brothers or principal men stand forth, and taking his spears, his shields and his sword hold them above his head and swear upon them in his name friendship eternal with the white man. "My hut is yours by day or by night; my country shall welcome you as a son of the soil. If you are in trouble I and my warriors are at your command to fight for you to the death; my wives are yours; the food of my land is yours." So runs the invocation with many laudatory terms of his own and his blood brother's prowess as warriors, our power and our invincibility when combined against all comers.

To a savage, the most precious thing in this world or the next are his spear and his arms of war; more precious than his own skin. They are his heirlooms, his sole possession—more thought of, more cared for than his wives—they are never out of his hands by day, they lie beside him at night. His oath is sworn on these, the gods of his existence. I fancy the inference is that if he turns traitor his own arms shall turn against him.

Then my pet rifle is held aloft over my head and my interpreter stands forward and repeats my pledge. That I will be a friend to these people; that my men shall not molest them; that if crops are stolen, or wrong done I will make it good; that if enemies attack him near to my camp I will help him; that he shall look on the British Company "as his big brother" whom he has to obey, but who have not come to eat up his land, or oust him from his place; and so on, according to the special stipulations I may wish to make with the individual chief. Then he produces his primest sheep, or goat, or ox. Part is eaten by him, part by me; the blood from my arm or chest has ceased to flow, and we rise as "blood brothers." Then I put down on paper what was the pith of the contract between us; *that* is a treaty as I consider it.

This is the ceremony in a savage land; but in Uganda the procedure is quite different. There the king and chiefs already have an infant civilisation. They most thoroughly understand the nature of a written contract, and consider nothing definitely binding till it is written down. Most of them write. Every clause is discussed in all its bearings, sometimes for days; words are altered, and the foresight and discrimination which the natives show in forecasting the bearing in the future of every stipulation is as keen almost as would be that of Europeans; then the document is translated into their language, Kiganda, and read in silence and with intense attention before the assembled chiefs in State Barza at the king's large assembly house; then the king makes his mark and every individual chief signs his

name. The treaties thus made by the representative of a company acting under Royal Charter are submitted at once for approval to Her Majesty's Government through the Foreign Office. It is obvious that it is only by an abuse of language that such action can be described as filibustering.

THE FAYUM AND LAKE MOERIS.*

THE degree of credence which it is considered safe to bestow on the descriptions of the early Greek geographers varies from time to time and from person to person in a somewhat curious manner. The existence of Lake Moeris, as described by Herodotus and subsequent writers, has been doubted, denied, and reasserted; the fact that it no longer exists is apparent, and theories to account for its disappearance if it did exist are numerous and most of them unsatisfactory. At present the balance of opinion, strengthened by recent readings of hieroglyphic inscriptions, inclines towards belief in the past existence of the lake, and the question of its exact situation has incidentally acquired more than historical interest. Mr. Cope Whitehouse has argued that if a lake capable of regulating the Nile floods and reinforcing the water-supply for irrigation at low Nile existed once, it must be possible to restore it and so vastly enhance the commercial value of the cotton-lands of Lower Egypt. There is practically no difference of opinion as to the neighbourhood near which this lake was situated. It must have been in the modern province of Fayum, an oasis lying much below Nile-level on the left bank of the river above Memphis, and irrigated from the Nile by a canal known as the Bahr Yusuf.

The drawback which beset the earlier theorists was their ignorance of the exact configuration of the district in question, and the only claim which Major Brown makes to originality is, that he has been able to argue out his views on the basis of an exact survey of the Fayum province. His position as Inspector-General of Irrigation for Upper Egypt has made him minutely familiar with the levels of the country, with the effect of evaporation, the regulation of irrigation, and all those practical details which enable one to form correct opinions on a question which largely involves engineering.

His book consists of five short chapters dealing respectively with The Fayum of To-day, Ancient Testimony about Lake Moeris, Theories as to where and what Lake Moeris was, History of the Fayum

* 'The Fayum and Lake Moeris,' by Major R. H. Brown, R.E. London, Edward Stanford: 1892.

Province, and lastly, The Fayum in the future and possible utilisation of the Wadi Raian. Of these the first and fourth are most important, and to their contents it is advisable to direct attention.

The Fayum is an oasis surrounded by desert, and separated from the Nile by a tract of barren sand from $2\frac{1}{2}$ to 7 miles wide, broken by a narrow fertile strip along the Bahr Yusuf. The contour-line of 100 feet above sea-level practically bounds the province, and except at the entrance of the Bahr Yusuf there is no gap below this level in the encircling hills. The map illustrating Mr. Cope Whitehouse's article in the *Proceedings* for 1890, p. 685, shows the approximate contour-lines of the depression, which in three places sinks below sea-level, viz., in the shallow Gharak Basin in the south, the larger Wadi Raian in the south-west, where the lowest point is 131 feet below sea-level, and surrounding the Birket-el-Kurun in the north-west, where the water-level of the lake stands at 141 feet below sea-level, and its deepest part is probably as much as 200. The Wadi Raian is separated from the Fayum proper by a gap at the level of 85 feet above the sea, and its hollow shows no trace of geologically recent water-action nor of Nile deposits. The whole of the Fayum depression dips towards Lake Kurun, to which all the surplus irrigation water finds its way; but evaporation is so far in excess of the supply, that since 1885 the level of the water has been falling at the average rate of 20 inches per annum. In the Fayum depression there are abundant deposits of Nile mud up to the contour-line of 85 feet, and the contours show a fan-shaped elevation projecting from the entrance of the Bahr Yusuf exactly similar in form to a delta thrown down by a mud-laden river entering a lake. The depression is now thoroughly irrigated and grows enormous quantities of cotton, cereals, and fruit, there being as a rule two crops in the year, and sometimes as many as three in fifteen months. A railway connects this fertile district with Cairo.

From his study of the figures, which are fully worked out in the book, Major Brown has come, with apparently good reason, to the conclusion that the whole Fayum province, excluding the Wadi Raian, was once a lake fed from the Nile—the original Lake Moeris; that this lake was not of artificial formation, but was brought under control by the Pharaohs, and the land gradually reclaimed; and that it might have been employed as a reservoir to supplement the low Nile. He enters very minutely into the statistics of Mr. Cope Whitehouse's plan for utilising the Wadi Raian as a storage reservoir. This could be done if no attempt were made to use it for modifying Nile floods. As a reservoir for supplementing low Niles in Lower Egypt the Wadi Raian could probably be used also to receive the irrigation, drainage, and surplus flood-waters of the Upper Nile valley.

Major Brown's work is so concise, as well as so thorough, that it is practically impossible to convey a correct impression of it in an abstract.

He brings forward no statement without a full array of reasons, and he contradicts no hypothesis without showing what he believes to be ample proof. The book is a model of scientific precision, and the illustrations from the author's photographs convey an admirable impression of the scenery of the district described.

A GREAT COLUMBAN ATLAS.*

THE reproduction of ancient maps has always had a peculiar interest to geographers, and such works as those of Santarem, Jomard, Nordenskiöld, and Lelewel have been of inestimable value to students of geography and history. Most of the maps in Santarem's and Jomard's atlases being coloured reproductions, necessarily convey a more correct idea of the originals than those in which this important feature has been omitted, and it is doubtless with the knowledge of this fact before them that the Berlin Geographical Society has been at such pains to give an exact reproduction of the maps contained in this atlas, which it has published in celebration of the fourth centenary of the discovery of America.

The production of this work, which is dedicated to the German Emperor, was undertaken by Dr. Konrad Kretschmer, under the direction of Baron von Richthofen, President of the Berlin Society, and the manner in which they have carried out the work reflects the greatest credit on themselves, and the Society to which they belong.

The atlas, which is accompanied by a volume of letterpress, contains the history of exploration and cartography from the time of Strabo to the sixteenth century. Twenty-four of the plates are reproductions, now published for the first time. They have been copied from parchment documents in all the principal European libraries, and are exact reproductions of the originals. Of the remaining sixteen maps, some have been reconstructed, or reduced in scale to meet the requirements of the atlas. Among the more striking maps are the following: Map by Bartolomeo Pareto, 1455, in the Victor Emanuel Library at Rome; map of the world by Giovanni Battista Calviro e Oliva, 1673, in the National Library of Naples; maps from the atlas of Angelus Eufredutius, 1556, in the Communal Library of Mantua; several maps by Battista Agnese, of the latter half of the sixteenth century, in the University Library of Bologna; map from the atlas of Aloysius Cesanis 1574, in the Library of Parma; copy of a globe by Francisus Bassus Mediolanensis, 1570, in the University Library of Turin. The circular maps, such as the Hereford map, have all been redrawn, coloured

* 'Atlas der Festschrift der Gesellschaft für Erdkunde zu Berlin zur Vierhundertjährigen Feier der Entdeckung Amerikas.' (With text).

alike, and reduced to an uniform scale, in order to facilitate comparison. It has been considered advisable to introduce some colouring on maps of the sixteenth century, to make the outline more distinct; but where this has been done, care has been taken to keep them uniform with the other coloured maps of the same period. Some of these have been published before by Jomard, Lelewel, and Santarem in black. All the maps have been photographed from Dr. Kretschmer's drawings, and printed in colour, except plates 22 and 31, which were engraved. It would be impossible to speak too highly of the manner in which these beautiful maps have been produced, and the more closely they are examined the more the excellence of the colour registering is observable; while the fact that they have been constructed under the supervision of Baron von Richthofen is sufficient guarantee that the maps accurately represent the originals.

The volume of letterpress is in itself a most valuable work on the gradual development of geographical knowledge from the earliest times to the sixteenth century. It contains six chapters, which in turn deal with the different epochs of geographical discovery. It may seem invidious to make any distinction where all is excellent; but as the occasion which has called forth this atlas is the celebration of the fourth centenary of the discovery of America, it seems probable that Chapter IV., which deals so ably with the state of geographical knowledge at the time of Columbus, will be read with greater interest than other portions of the book. To geographers, however, there is no portion of the letterpress which does not contain matter of interest; and, taken as a whole, it is a monument of painstaking research. In the interest of those who do not possess the advantage of being able to read German readily, it is to be hoped that an English edition of the letterpress may soon be published; meanwhile, the Berlin Geographical Society, its President, and Dr. Konrad Kretschmer, have laid the geographers of the world under considerable obligation to them by the production of this admirable work.

THE GEOGRAPHICAL JOURNAL.

At the commencement of this new series of the Society's monthly publication, it may not be uninteresting to recall its growth in the past. Mr. Markham, in his 'Fifty Years' Work of the Royal Geographical Society,' published in 1881, has summarised the early changes which led to the form then established. From the foundation of the Society in 1830, a *Journal* was issued containing the papers read at the meetings, illustrative maps, and analyses of other papers on kindred subjects. Lists of recent geographical publications and maps were subsequently added, and the annual volume was issued in two, or occasionally, in three parts. In 1847, the *Journal* took a

backward step, the analyses of papers not read to the Society, and the miscellaneous information were discontinued; and from 1848 to 1855, the *Journal* was only issued once a year. The thin volumes of those years remain as an outward sign of the crisis which the Society successfully passed through in that period of reduced resources. With regained prosperity and increasing membership, the demand for a more comprehensive and speedy method of publication naturally arose. The number of members increased rapidly from 700 in 1850 to over 1000 in 1858; it exceeded 2000 in 1868, and reached 3000 in 1876. Since that time the rate of growth though slow, has been steady. Mr. Francis Galton, then Secretary, proposed to issue *Proceedings* supplementary to the *Journal* in 1855. The *Proceedings*, as then arranged, contained reports of the evening meetings, and a variable amount of general geographical information. The parts were issued irregularly, about six being published in the course of a year. The *Journal* continued to appear annually, and in it the larger and more important papers and maps communicated to the Society were given to the world. The next change of importance was the successful attempt in 1879 to retrieve a lost opportunity.

In 1872 Mr. Clements R. Markham, at that time one of the Secretaries, realising the public demand for a geographical journal on a wider basis and of more popular form than then existed, and finding that the Council were reluctant to modify the Society's publications, became editor of *Ocean Highways—The Geographical Record*, which subsequently had the sub-title of *The Geographical Review*, and finally took as its name, *The Geographical Magazine*. This Magazine was quite unconnected with the Society. It aimed to advance geographical knowledge by means of original articles, reviews of books and of maps, concise items of geographical news, obituaries and personal notices, together with reports of meetings of Geographical Societies and original maps. The magazine was published monthly, and acquired a good circulation. Its last number appeared in December 1878, the date at which the twenty-second and last volume of the old series of *Proceedings* was completed. Mr. Markham, in referring to the old *Proceedings*, observed, "This publication was capable of great improvement and of being made the leading authority in the world on all subjects relating to geography." It is largely to his success in showing the way by means of the *Geographical Magazine* that the new series of *Proceedings* was started on such admirable lines. "The *Geographical Magazine*," he said, "completed its work and fulfilled its mission. Its labours were not in vain, its objects did not die with it, but were actively and ably pursued by its successor." The new series of *Proceedings* incorporated many of the new features which the *Geographical Magazine*, now stopped by arrangement, had experimented with and proved to be of value. The parts appeared monthly and contained the papers read to the Society,

with the discussion which followed, occasional illustrations and maps. Other papers were also published, together with geographical notes, reports of the Society's meetings and of the proceedings of foreign societies, obituary notices of deceased fellows, correspondence, and brief non-critical notices of new books and maps. The fiftieth and last volume of the *Journal* appeared in 1881, although the volumes of *Supplementary Papers* which are still published at irregular intervals may be taken as representing it.

'The Proceedings of the Royal Geographical Society, and Monthly Record of Geography,' retained its original form for fourteen years, but minor modifications were introduced from time to time, by order of the Council, or at the suggestion of the Editor. More space came to be devoted to notes and book notices, and in the last few years illustrations and block-maps, in the text, were much more frequently introduced. The steady growth of the Society, and the stimulus given to scientific geography by the action of the Universities, at the instigation of the Society, have once more led to a demand for fresh expansion. It is felt that if the Society's publication is to maintain its position as the leading geographical journal in the English language, it must be made more systematic and more exhaustive. While if it is to take the place which a serial on the lines of the old *Geographical Magazine* might now hold, more attention must be paid to literary form, and to the methods of illustration. The fundamental object of the *Geographical Journal* is to carry out in its fullest meaning the first article of the Society's constitution. "The Royal Geographical Society is instituted for the improvement and diffusion of Geographical Knowledge." In pursuit of such an ideal it is not enough to keep from losing ground. The whole current of periodical literature has swept forward into a new region during the last twenty years, and the *Geographical Journal* is the natural outcome of the progressive growth of the *Proceedings*.

The *Geographical Journal* will in substance differ little from recent volumes of the *Proceedings*. "The Monthly Record" will be the old "Notes" arranged systematically, and selected so as to give a general view of the geographical work and thought of the world during the preceding month. The "Geographical Literature of the Month" will revert to the early system of giving a brief non-critical notice of all books added to the library. It will also include a systematic list of all important articles in other geographical journals, British, Colonial, and Foreign, and of geographical papers in any periodical publications which come under the notice of the Society. In this way there will be a monthly subject-index to current geographical literature that cannot fail to be useful to all working geographers. The value of this list will be more apparent when the exhaustive subject-catalogue of the Society's Library now in hand is completed, as that catalogue will thus be kept continuously up to date. The section

devoted to New Maps will be arranged on essentially the same lines. Both books and maps of importance will be occasionally reviewed at length in separate articles.

It is hoped that in its new form the Society's *Journal* will be found interesting by a larger circle than that of the Fellows alone, and that the impartial and authoritative descriptions of the regions on which public interest is for a time concentrated will be helpful to all who really wish to grasp and comprehend the geographical conditions on which modern politics and commerce are based.

THE MONTHLY RECORD.

THE SOCIETY.

Programme for 1893.—The Second and longer portion of the Session promises to be of considerable interest. The first paper in January will be by Mr. Charles Hose, one of the residents under the Rajah of Sarawak, Borneo, who has travelled extensively in the interior. On January 30 two interesting papers on 'The Island of Yesso' are expected—one by Professor John Milne, F.R.S., of the Engineering College, Tokio; the other by Mr. A. H. Savage Landor, who has been all round the island and up some of its principal rivers. Mr. F. C. Selous has just returned from Mashonaland, and as at present arranged he will give the leading results of his twenty years' wanderings in South Africa on February 13th. It is hoped that Captain Bower will be able to give an account of his remarkable journey across Tibet at the other meeting in February. The two March meetings may be occupied by Professor Bonney, F.R.S., on 'The Work of Glaciers on the Earth's Surface,' and Mr. H. O. Forbes, on his investigation of the Chatham Islands. The papers for the other dates are not at present fixed. Mr. W. M. Conway hopes to be ready by the April meeting to describe the results of his expedition to the Karakoram Mountains. Other papers promised are by Captain Pringle, on the Railway Survey from Mombasa to the Victoria Nyanza; Mr. W. W. Rockhill, on his remarkable Journeys in Eastern Tibet; Lieutenant Peary, on his Expedition to the North of Greenland, and his proposed Expedition towards the North Pole. Mr. H. J. Mackinder begins his course of educational lectures on Friday, January 20; Fellows of the Society who mean to attend are requested to inform the Secretary by January 13.

EUROPE.

The Baltic Lake-plateau.—Dr. W. Ule has lately contributed to *Ausland*, an investigation of the agencies which produced the lake-dotted band of high ground traversing the North-German plain south of

the Baltic. The flanks of this ridge form both to north and south a gently undulating tract, often unfit for cultivation, and covered only with firs and heath. In the centre is a confused jumble of hills and deeply-cut valleys, where fields, green pastures, and woods of deciduous trees meet the eye. A general view of the region on a map shows that hills and valleys follow a prevailing north-east and south-west, or north-west and south-east direction. Lakes, some with very irregular outline, others occupying wide basins, or narrow river-like channels, abound in all parts, but are, as a rule, of simpler outline in the outer than in the central tract. An important fact brought out by soundings and other observations, is that the form and geological structure of the basins is the same above and below the water-line; therefore they must date from the original deposit of the surface formation, and depend for their origin on the causes which have produced the general features of the country. The most important of these seems undoubtedly the massive ice-sheet, which, according to geologists, once spread over the whole North-German plain. Beneath 330 feet thickness of glacial deposits Jurassic strata appear, showing that even before the ice age a rising ground existed, which probably formed a dam to the progress of the ice southwards. The ridges and hollows seem, however, to be due to the ice which, overcoming the resistance of the loose surface materials would keep in the main one direction, and as it periodically diminished and extended, would form parallel deposits of boulder-clay both at its end and sides. Boulder-clay constitutes the chief surface material in the central region, while sand, etc., spread over the country by the water rushing from the glacier-wall forms the outer tract. Running water must have been an important agent. The streams beneath the ice-sheet would have some effect, but more so those resulting from the melting of the ice during its slow retreat, and those of post-glacial times, though the importance of these last would be limited somewhat by the large number of basins which have no outlet. Underground waters too, probably play their part. It seems that many of the enclosed basins are drained in this way, in consequence of which the soluble components of the soil would be carried away, and sinking of the ground perhaps result. In this way the existence of the many pools on otherwise level ground, as to which we have yet no other explanation, would be accounted for. Lastly, the action of the wind in removing and depositing materials deserves notice. At present we cannot determine the precise share of work done by each of these agencies, and mistakes have been made by insisting on one or another to the exclusion of the rest.

Highest Summit in the Crimea.—Recent surveys in the Crimea have rectified the altitudes of some of the summits. Hitherto Russians have looked upon Chatir Dag as the greatest height of European Russia, but,

it now appears that Roman Kesh is higher, having an altitude of 5061 feet, being 59 feet greater than Chatir Dagh.

Exploration in the Eastern Caucasus.—Herr Merzbacher sends an account of his travels in the Eastern Caucasus during last summer. The traveller was forced to give up his original plan of continuing the exploration of the Bezingi Group in the Central Caucasus by the cholera, which raged throughout the Nalchik district, and the consequent local quarantines and other obstacles. He therefore turned his attention to the lofty and comparatively isolated Tebulos and Bogos Groups, which separate Daghestan from the country of the Chevsurs and Tushets on the south, and the Bogos Range in the heart of Daghestan, known to us through Dr. Radde's travels, but hitherto unexplored above the snow-level. On July 17th Herr Merzbacher left Tiflis with two Tyrolese guides and crossed the Adzumba Pass to Tushety. In this region the rainy season generally lasts from the middle of July to the end of September, and the travellers were warned on all sides to expect bad weather. They were, however, favoured with the finest weather, as well as by the valuable assistance of the government officials, and Herr Merzbacher's own experience in the previous year in the Central Caucasus. "Consequently," he writes, "I was able fully to carry out my plans, to explore thoroughly the mountain groups, and to obtain many observations and photographs from high stations, which will be of great service in determining the orographical details. The characteristics of the Tebulos Group are the jaggedness of the ridges and sharpness of the ice-crests. In the Donos Group the variety and grandeur of the mountain forms exceed even those of the Tyrolese Dolomites. In the Bogos or Botshok Group, on the other hand, the extent and magnificence of the glaciers is the chief feature. In this respect they can compare with many parts of the Central Caucasus, as the inferior height of the peaks is compensated for by the low elevations to which the glaciers descend in the valleys. Nowhere have I seen more beautiful valleys, and I think my photographs will prove this. The mountains of Daghestan conceal in their recesses scenery, the magnificence of which is still wholly unknown to the world, and beyond my powers of description. The character of the landscape differs entirely from that of the Central Caucasus or the Alps, and the people and their dwellings and customs are so interesting that I came back delighted with my journey. The following is a list of the summits I ascended. The heights are given provisionally in round numbers until my observations upon which I am now occupied are fully worked out. Tebulos Group: Spur of Tebulos, 13,290 feet; Tebulos Mta, 14,930 feet; Tuga Mta, 13,940 feet. Donos Group: Kunito Tau, 14,140 feet; Donos Mta, 13,940 feet; Rock Peak of Kocheksferi, 12,140 feet; Diklos Mta, 14,040 feet. Bogos Group:

Anchovalla, 13,450; Bogos Mir, 13,610; Belenki Mir, 13,520; Addalashukhol, 13,780. On October 23rd I ascended Ararat from the south-east. At this season it was impossible to camp higher than 9000 feet, and the ascent of the remaining 8000 feet took nearly twelve hours, and was very fatiguing. We were very disagreeably affected by the rarity of the air."

ASIA.

The Old Bed of the Oxus.—Among the latest contributions to this much-vexed question, those of R. v. Erckert and W. Komischke in recent numbers of *Ausland* are of some interest. The statements of early writers from Herodotus to the Arab historians, that an arm of the Oxus emptied itself into the Caspian (at least intermittently) are well known, and this arm has been identified with the Usboi channel, which traverses the Kara Kum desert in the latitude of the lower half of the Caspian. The historical side of the question is fully dealt with in the papers referred to, and we can only notice here, firstly, the universal confusion of the Aral with the Caspian down to the 10th century of our era, the latter being supposed to stretch east and west, instead of north and south, and secondly, that the sea, spoken of by the Arabian writers does not at all agree with the Caspian in extent and distance from Khiva, and that there is no trace of the extensive population and cultivation spoken of by them along the said arm, anywhere in the vicinity of the Usboi channel. Both writers come to practically the same conclusion from an examination of the question in the light of recent geological and other surveys, principally those of Mushkétof and A. Konshin. (This question has been fully dealt with by Mr. Delmar Morgan in the *Proceedings* for 1892, p. 236.) Komischke traces the gradual drying up of the old sea which, according to Mushkétof, filled the basin of Turkestan, and whose old shore-line may still be seen in parts of the desert, *e.g.*, near Charjui. The Usboi formed the last connecting channel between the Caspian and Aral basins, after the elevation of the Ust Urt plateau and Balkan ranges had separated them elsewhere. It is evident that the Arabian writers may have been justified in their statements as to the arm of the Oxus flowing to the Caspian (Masudi speaks of it as derived from Lake Aral, into which the Oxus had first entered) by temporary overflowings of the Sari-Kamish basin owing to unusual floods in the Oxus.

The Lake on the Great White Mountain.—The photograph from which the accompanying illustration is taken has been sent to the Society by Captain A. Cavendish, who writes:—"The photograph sent is combined from three taken with a small 'Kodak' by Captain Goold-Adams, R.A., in October, 1891. He and I travelled in Korea, and owing to the impossibility of getting enough men to carry provisions, &c.,

for two, he alone made the ascent of the White Mountain. He left Po-chin (see Mr. C. W. Campbell's map in the *Proceedings* for March, 1892), and reached the mountain by the right bank of the Yalu, making the ascent from the same hut as Mr. James, Mr. Fulford, and Captain Younghusband did. He with great difficulty induced a young Korean to ascend the mountain with him; the other seven Koreans in the party were afraid to do so. The photograph was taken looking about north-north-east across the lake, and the source of the Erhtao-chiang, the eastern branch of the Sungari, flows through the cleft on the north



LAKE ON GREAT WHITE MOUNTAIN.

side of the lake. Captain Goold-Adams with an aneroid calculated the height of the mountain to be 8700 feet above the sea. I hope some day to get some more photographs of this unexplored region, as I intend, if possible, to revisit it."

The Ruins of Karakoram.—The position of the ruined city of Karakoram, in Mongolia, has been the subject of much discussion, and alternative sites are shown in the last edition of Stieler's atlas, according to the rival theories of D'Anville and Remusat. Paderin's visit to the region in 1873 resulted in the discovery of a third probable site (not shown in Stieler) considerably to the north of either of the others (see *Geographical Magazine*, I. (1874), p. 137), and almost due west of Urga. The modern name of this place is Kara Balgassum, and its position, as determined by Yadrintzeff in 1890 (see *Proceedings*, 1891, p. 385), is $47^{\circ} 15' N.$ and $102^{\circ} 20' 15'' E.$, a position somewhat south-west of Paderin's. Several English travellers have planned to visit Karakoram, but none are actually *en route*. Meanwhile we are informed by the *Deutsche Rundschau*, that Dr. J. Troll has set out for an exploring journey in Central Asia, having reached Samarkand in the end of

October last with the view of travelling through Russian and Chinese Turkestan, studying the Karakoram ruins, and returning through Peking and Shanghai.

Himalayan Exploration.—The *Oesterreichische Alpenzeitung* for December 9 contains a short account of Dr. C. Diener's Expedition to the Central Himalayas. Dr. Diener's party, which included Messrs. C. L. Griesbach and C. S. Middlemiss, of the Indian Geological Survey, left Naini-Tal on May 21st, and proceeded by Almora to Milam, the last village in the valley of the Gori-Ganga, situated at an elevation of 11,200 feet. The second week in June was devoted to the exploration of the Milam Glacier and its environs; in size this glacier may be compared to the Aletsch Glacier. On June 19th the travellers started northwards with 20 coolies, 43 yaks, and a herd of sheep and goats. They crossed the Utadurra Pass (17,590 feet), and spent a fortnight in and about the Girthi Valley. Early in July they succeeded in penetrating to the little explored district of Hundes (Tibet), by way of the Kiangur and Kioghar-Chaldu Passes, whose heights are 17,000 feet and 17,440 feet respectively. The following peaks (among others) were ascended:—Chitichun, No. 1 (17,740 feet), four times, Chanambaniali, No. 1 (18,360 feet), Chanambaniali, No. 2 (18,320 feet); Kungribingri (19,170 feet), was ascended by Dr. Diener alone. At the end of July, after having been confined to their camp at an elevation of over 17,000 feet for three days by a snowstorm, the party crossed the Kungribingri Pass (18,300 feet), the Jandi Pass (about 18,400 feet), and the Utadurra Pass (17,590 feet), and regained British territory. Some opposition on the part of the Tibetans having been overcome, the travellers started on August 13th for Barahoti and Rimkin-Paiar. The Utadurra and Kiangur Passes were recrossed, the Shalshal Pass visited on August 20, and the next fortnight spent in and about Rimkin-Paiar. The first week in September was spent on a visit to Niti, reached by way of the Silakank Pass (17,800 feet). An excursion to the Niti Pass (16,628 feet) took Dr. Diener once more on to Tibetan territory, after which the return journey was made through the Dhanli Ganga and Alaknanda Valley, and by way of Ranikhet to Naini Tal, reached on October 7. In view of the scientific aims of the undertaking, purely mountaineering exploits were few. Still their stay of some weeks in the neighbourhood of Nanda-Devi (25,600 feet), the chief peak of the Central Himalayas, gave the travellers a glimpse at least of the grand scenery of these mountains. For four weeks they never camped below 14,500 feet; provisions and fuel were frequently difficult to obtain. The weather was very bad; August had twenty-six rainy days; and furious storms swept the Tibetan slope of the main chain almost continually. As regards mountain sickness, the experiences of Dr. Diener's party unfortunately were more like those of Mr. Whymper than those of Mr.

Conway. It is remarkable, however, that their sufferings were frequently greater at 17,000 feet than at higher levels. Dr. Diener has just returned to Vienna.

Further work accomplished by the Indian Survey Parties.—We learn from recent official information that in Bengal, during the last field season, No. 2 party completed 498 square miles of cadastral survey and 297 square miles of traverse survey in Chittagong, besides 150 square miles of traverse survey in the estates of the Rajah of Hill Tippera. In Orissa, No. 8 party completed the cadastral survey of 1773 square miles (inclusive of 364 square miles of revision survey in the irrigated area of district Cuttack) and traverse survey of 2009 square miles in districts Puri, Cuttack, and Balasore. Among the operations to be undertaken during the ensuing field season we learn that a detachment will be formed from the present Behar Traverse Detachment to undertake the resurvey of the Indus River in Sind.

AFRICA.

Projected Central African Telegraph.—The British South African Company has carried a telegraph line through Mashonaland from the borders of Cape Colony to Fort Salisbury, and the line is being extended across the Zambesi to Blantyre. From this point Mr. Cecil Rhodes proposes to construct a line along the great meridional furrow of Central Africa by the side of Lakes Nyasa and Tanganyika to terminate for the present in Uganda, but he contemplates ultimate extension down the Nile valley to connect with the Egyptian system. There are no physical obstacles in the path of the proposed line; perhaps the most serious difficulty will be found in procuring telegraph posts that will resist the white ant. The natives, whose territory would be traversed, are of a peaceful character, and in great part already in the initial stage of civilisation through the labours of European missionaries. It may be a question whether the saving in expenses for maintenance might not justify the use of a light cable along the bed of Lakes Nyasa and Tanganyika, and across the Victoria Nyanza. Into the financial aspects of the project it is not our duty to enquire, but that the subject has been deemed worthy of geographical consideration is plain from the fact that a substantially similar scheme was discussed and reported on by a Committee of Council of the Royal Geographical Society twelve years ago. At the time when the scheme was first suggested the Egyptian government could guarantee the maintenance and protection of the line from Egypt to the Victoria Nyanza, and there was then no cable to Cape Town or Zanzibar. Hence the value of the line would have been very great. Africa has now been practically encircled by cables, and there is no necessity for running the overland line from the head of Lake Nyasa to Bagamoyo for communication with Zanzibar, and

thence back to the Victoria Nyanza as suggested in the report of the committee referred to. Full particulars of the earlier scheme will be found in Vol. XXI. of the old series of *Proceedings*, p. 616, and in the *Proceedings*, new series, Vol. I. (1879) pp. 123, 217, 264-271 (the Committee's Report).

Diogo Caõ.—It has always been supposed and affirmed that Diogo Cao, in 1484, discovered the mouth of the Zaire or Congo River, erecting on its left bank a stone pillar with the arms of Portugal, and an inscription in Portuguese and Latin (Barros), or in Portuguese, Latin, and Arabic (Pacheco), and two other pillars, also between 1484 and 1486, further south, on Capes St. Augustin (Santa Maria), and Negro, which pillars were called *Padraõs*. The stone pillar of the Zaire or Congo River was, says Señor Cordeiro, in the *Boletim* of the Geographical Society of Lisbon, broken some time before 1859, by the cannon shot of an English man-of-war. The fragments of the other two were brought back to Portugal in the beginning of the present year, and are to be seen in the rooms of the Lisbon Geographical Society. Señor Cordeiro has now deciphered and published, in *facsimile*, the inscription, which is written only in Portuguese, of the *Padraõ* of St. Augustin, ($13^{\circ} 27' 15''$ S., not $15^{\circ} 50'$ as Major says). It is thereon said that the year of its erection and, therefore, of the discovery of the Zaire or Congo River, was 1482. Diogo Caõ's third and last *Padraõ* was erected on Cape Negro ($15^{\circ} 40' 30''$ S., not on Cape Cross, as Major says).

Progress in Nyasaland.—Our last letters from Nyasaland announce that quiet was still prevailing among the natives in the Shiré Highlands, and that many Europeans were arriving to take up land for coffee-planting. The British gun-boats for Lake Nyasa were expected to arrive at the Chinde mouth of the Zambesi, on October 5th, and to be on the Upper Shiré, ready to be put together early this year, before the commencement of the rainy season. It was supposed that Commander Keane, R.N., would be sent out to superintend the work. Meanwhile Capt. Selater was making great exertions to improve the road between Katunga's and Blantyre, up which the gun-boats would have to be carried. This route rises 2,000 feet in the first 10 miles, and the work upon it is said to be fearfully heavy. It was very difficult to get the natives to work at it at all. They do not object to hoeing and clearing land, as that they are used to; but why a road should be required is more than they can comprehend, and many of them refuse to work at this kind of labour. Herr Wissmann and the German gun-boat were still slowly ascending the Lower Zambesi, and it was hoped that the British vessels would be launched on Lake Nyasa before the German gun-boat was ready. In accordance with orders from H.M. Commissioner, Capt. Selater had made a short journey from Blantyre into the valley of the Moanza, which joins the Shiré opposite Mbewé. The

intervening range was found at this time of year to be nearly waterless. At Mikolongo in the Upper Moanza valley, where the chief Kavira resides, he had met with M. Foa, an agent of the Central African Company, who claim large tracts of land on the south side of the Shiré. Two neighbouring chiefs, who were proposing to settle a long-standing quarrel by fighting it out, were visited and warned that such practices could no longer be permitted within the British "sphere of influence." Capt. Sclater returned to Blantyre down the Moanza valley. The first collections made by Mr. Alexander Whyte, the naturalist attached to Commissioner Johnston's staff, have arrived in this country, and have been carefully examined by various experts. They are mostly from the high ranges of Zomba and Milanji, and contain many novelties. Dr. Günther's report on the reptiles and that of Mr. Oldfield Thomas on the mammals were read at the Zoological Society's meeting on November 1st last year and will shortly be published in that Society's *Proceedings*. Among the reptiles are examples of three new species of chameleons, two of which—one belonging to the genus *Rhampholeon*—are remarkable for their extremely short tails. A paper by Capt. Shelley on Mr. Whyte's collection of birds from the Shiré Highlands, appears in *The Ibis* for the present month. Representatives of twelve new species were in the series, amongst which is a new song-thrush from Mount Milanji (*Turdus milanjiensis*). The plants, which have been examined by the officers of the botanical department of the British Museum, likewise present many features of great interest. The large coniferous tree of Mount Milanji, described by Mr. Whyte as a cypress (see *Proceedings*, R.G.S. 1892, p. 472), turns out to be a new *Widdringtonia*, which has been named after its discoverer *W. whytei*. A complete set of all the collections has been presented to the British Museum.

Dr. Stuhlmann's African Work.—Probably few amongst those who scan the map of Africa or listen to the record of travel in that continent realise the enormous amount of labour involved in filling in the details of only a small corner of unexplored land. The *Deutsches Kolonialblatt* gives a brief summary of the cartographic material accumulated by Dr. Stuhlmann, which effectively illustrates the activity in observing and recording demanded of an explorer who is at the same time a geographer. The list of the material brought back is as follows:—A route-map of 146 octavo sheets, showing the journey from Kafuro to the most northerly point reached in Southern Momfu. The direction of the line of march is noted at intervals of five minutes, and many thousand compass-bearings taken to distant mountains and other conspicuous objects. A series of profiles of hill-slopes, and of the country generally, comprising no less than 105 sections of the country between Kafuro and the west of the Albert Lake. A journal containing a transcript of the geodetic measurements about Bukoba, with numerous

compass bearings, including also observations on the return journey to Muanza, in which many of the islands in the south-western part of the Victoria Nyanza had their position fixed. Two small journals, with original entries of the route to the coast at Bagamoyo. A map of the route from Muanza to Bagamoyo on the scale of one minute of marching to a millimetre. This occupies forty-six sheets, with a total length when put together of 40 feet. It was accompanied by thirteen tables, showing mountain profiles. About twenty-four sketch-maps incorporating some of the facts in a provisional way for special regions, drawn on the spot. A curve showing sixty-five astronomically-determined positions and magnetic observations. Finally, there was a large folio volume, partly filled in by Emin Pasha and continued by Dr. Stuhlmann, giving all the estimates of height, boiling-point readings, and meteorological observations, extending to about 70,000 separate entries. Besides this purely cartographic material, the expedition brought home large collections of specimens in different departments of natural history, voluminous notes on the people met with, and vocabularies of twenty different languages. When it is remembered that careful collation and often laborious calculations are necessary before a correct map can be constructed from the data collected, one cannot be surprised at the fact that years are frequently necessary before a book of true geographical travel can be presented to the public.

Death of Cardinal Lavigerie.—We must record the death at Saint Eugene, near Algiers, on November 26th, of Cardinal Lavigerie, whose active exertions against the African slave trade are so well known. He was seventy-seven years of age, and for the last thirty years has been the most energetic organiser of the French missions. He founded the mission of the "White Fathers" and "White Sisters" in 1868, and in 1888 he convened the great International Anti-Slavery Conference, from which the Belgian Anti-Slavery Society resulted.

Return of Captain Monteil.—Captain Monteil and his companion Badaire, whose arrival at Tejerri from Lake Chad we noticed last month, have reached Paris, where they received a most cordial reception on December 20th.

On a New Route from the Rovuma to Chitesi on Lake Nyasa.—The Very Rev. Archdeacon Maples sends us a map of the routes which he followed in 1886 and 1891 in his journeys from Mponda's, on the Rovuma River to Chitesi's on Lake Nyasa. He writes: "I place Unangu rather differently from where the Rev. W. P. T. Johnson placed it (see Mr. Johnson's map in *Proceedings* of the Royal Geographical Society, September, 1884), but he inclines to think that my placing is right and his wrong. I give the course of the Losheringo west of his placing. He thinks I am probably right there too. I

from Berbera as far south as Melmil, and both he and Mr. Gregory have received instruction in surveying and practical astronomy at this Society's observatory under Mr. Coles. One of the principal objects of the expedition is to obtain sport; but as portions of the country through which it is proposed to travel are entirely unknown, the necessary instruments for fixing positions and surveying have not been forgotten. The party in this respect is well equipped, and there is every reason to hope that the results obtained will add considerably to our knowledge of the geography, geology, and natural history of this little-known part of Africa. The route Lieutenant Villiers and his companions propose to follow, from the head of navigation of the Juba, is across the unexplored country which lies between this river and Lake Rudolf; thence, if possible, to return N.E. across the country of the Galla tribes and Somaliland to Berbera. A somewhat novel incident has occurred in the matter of providing food for the porters, etc.; it was found that dates and rice could be more easily and cheaply procured in London than at Aden, and, as a consequence, the quantities required of these two articles were purchased in England and shipped out to East Africa.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Measurements of an Arc of the Meridian.—M. L. Bassot summarises in the *Comptes Rendus* the new geodetic operations which have completed the remeasurement of an arc of the meridian decided on in 1869, and undertaken after the war of 1870. General Perrier, afterwards assisted by Captain Defforges and M. Bassot carried out the work. The operations included (1) the establishment of a complete chain between the Spanish frontier and Dunkirk, bringing it into relation as far as possible with each of the parallel chains of the old survey; (2) the redetermination of the coordinates of the Pantheon, the starting-point of the French triangulations; (3) the measurement of the base lines in terms of the standard metre; and (4) the calculation of the length of the arc and the corrections of previous measurements which directly depended on it. The work is now practically finished, and the French triangulation is connected by actual observation with the surveys of England and of Spain. The recalculation of the main lines of the network of French survey shows complete accordance with the triangulation of England, Italy, and Belgium; but a discrepancy with that of Spain amounting to $\frac{1}{253000}$. The total length of the meridian between the extreme points which have been fixed astronomically, a distance of about $8^{\circ} 17'$, is only 16.4 feet less than that calculated on the assumptions of Clarke's ellipsoid, which assumes a polar flattening of $\frac{1}{293140}$. This theoretical value is thus confirmed. The new measurement between the extreme point shows the length to be 146.6 feet, or $\frac{1}{20000}$ greater than was deduced by Delambre when measuring for the value of the metre at the end of last century.

Observatory on Mont Blanc.—M. Janssen has reported to the Paris Academy of Sciences on the progress made this summer with the work of erecting an observatory on the highest summit in Europe. Two tunnels, 75 feet long, have been driven through the ice, about 40 feet below the summit, horizontally, from different sides, at an angle of 45° to each other but without reaching rock. The possibility of a rock foundation being thus made very doubtful, it was decided to build the house on the snow. To test the conditions of compacted snow, M. Janssen experimented last winter with an artificial snow mound at the Observatory at Meudon. He levelled the surface of this mound, and placed on it discs of lead 14 inches in diameter and weighing about 66 lbs. each. The impression in the snow made by twelve such discs weighing altogether nearly 800 lbs. on an area of about one square foot, was barely one-third of an inch. It is proposed to make the observatory in the form of a truncated pyramid, the whole lower storey being embedded in the snow, thus securing a relatively large base to resist the pressure of the wind on the upper part. The base of the rectangular wooden building would be 33 feet by 16 feet 6 inches, and trap-doors in the floor would permit of the adjustment of screws by which the exact position of the structure could be maintained in spite of slow movements of the ice. The walls, windows, and doors would all be double to secure warmth. An observatory on this plan has been built and conveyed to Chamonix; most of it has been carried in sections to the Grands Mulets, and about one-quarter has been taken to the new hut on Roches Rouges only 980 feet from the summit. Next year should see the work completed, and volunteer observers will not be wanting to study the many interesting questions which the unique position of the new observatory brings within the reach of science.

Time Standards.—M. E. Lullin, a Swiss engineer, publishes a pamphlet on time standards for the world, in which he states the case against the adoption of the hour-zone system. One grave objection on the continent of Europe is, the difficulty of adopting any standard based on the meridian of Greenwich; another and more practical difficulty is the abrupt change of one hour from zone to zone. The plan proposed is that each town should employ its own local time, and for international purposes universal time should be used, a constant correction sufficing in each case to make the change. Universal time should be reckoned from a neutral meridian, and M. Lullin proposes that traversing Bering Strait and the Central Pacific on one side and Central Europe ($12^{\circ} 30'$ East of Greenwich) on the other, the Pacific meridian would be 0° , the European 180° , but to complete the system all longitudes would be reckoned in their time-equivalents. Thus by making midnight of universal time that of the Pacific meridian, the longitude of any place in hours, minutes, and seconds of time, is the

correction to be applied to the local time to bring it into harmony with the universal. The scheme is worked out with numerous examples. A defence of the principle of local time also appears in the current number of the *Journal* of the Manchester Geographical Society: but in spite of all that can be said for this system, it is unlikely to be generally adopted. The fact that so large a portion of the Earth's surface has already adopted the hour-zone reckoning from Greenwich (*Proceedings*, 1892, p. 465) is enough of itself to ensure the ultimate adoption of that system everywhere.

CORRESPONDENCE.

*The Position of Salaga, West Africa.**

SALAGA, October 8th, 1892.

TO THE ROYAL GEOGRAPHICAL SOCIETY, LONDON.

The geographical position of Salaga in the Hinterland of the Gold Coast, West Africa, has been frequently discussed. The discrepancy between different maps as to longitude amounts in some cases to 50'. Personally, I am convinced that Capt. Binger's longitude is wrong to a considerable extent. If it were right, the magnetic variation on the way from Akra to Salaga would be easterly, not westerly, and a large portion of Dahomé would have to be attached to the colony of Lagos. As a matter of fact, there is no place on the Gold or Slave Coasts the position of which has been really satisfactorily determined; and we may look for errors of from 1' to 3' in the generally accepted positions.

I beg to draw the attention of the Council of the Royal Geographical Society to this matter, in the hope that they may use their influence in the proper quarter in order to have the positions of certain places—say Akra on the Gold Coast, Lagos and Akassa on the Slave Coast finally determined by telegraph.

I remain, &c.,

GOTTLIEB ADOLF KRAUSE,

Ada, Gold Coast.

OBITUARY.

Major-General Shdanoff.—We regret extremely to have to announce the premature death of Major-General Shdanoff, chief of the Topographical Section of the Caucasus Military District, who was elected an Honorary Fellow of the Society only last summer. As director of the Caucasian Survey, General Shdanoff rendered great services to cartography and travellers. He was instrumental in carrying out the resurvey of the mountain region which is still in progress, and of which some of the first fruits in the shape of preliminary sheets have from time to time reached the Society. One of his last acts was to send two sheets of this survey to our Secretaries, who received them after the news of his death. In the new map the physical features of the chain are for the first time laid down with any approach to accuracy in

* Translation.

detail. The aim of the surveyors has been high. (Messieurs Jokoff, Bogdanoff, and Golombievsky, and their fellow-workers have not been content to improve on the old 5-verst map; they have made it their endeavour to produce the materials of a map which may rival the best mountain surveys of Western Europe. In a very interesting and detailed letter written to Mr. D. W. Freshfield, a few weeks before his fatal illness, General Shdanoff set out his scheme for the publication of the new map, and expressed his earnest hope that he might be provided by his Government with funds adequate to ensure its rapid completion. The following quotation from it will be read with interest and sympathy:—

“The Council expresses the hope that by the date of the Geographical Congress in 1895 specimen sheets of a new map of the Caucasus will be ready—meaning the new 5 verst to an inch map. I have begun, in fact, to prepare a new edition of the 5 verst map; but the whole advances very slowly on account of the few workers in our topographical section, especially as regards engraving.

“The division of the new map into sheets will be the same as before, so that each sheet of the new map might be substituted for the corresponding old one. The mountains will be rendered by contour lines. The printing is proposed to be done in four colours, or even five: (1) the mountains; (2) the forests; (3) the rivers; lakes, and snowfields; (4) the other physical features and all letterpress. A fifth colour may be used in time to mark administrative frontiers and the districts.

“The originals of the new sheets are prepared for each colour by photographic reproduction directly from the survey sheets.”

It is to be desired in the interest of geography that the Russian Government may be fortunate in finding a successor to General Shdanoff, equally imbued with scientific zeal, and as generous in assisting independent explorers of whatever nationality.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1892-93.

Special Meeting, November 24th, 1892.—General Sir C. P. BRAUCHAMP
WALKER, K.C.B., in the Chair.

Before the reading of the paper the CHAIRMAN made the following remarks:—

We have been—I speak for the Council—under some small difficulty as regards Captain Lugard's last lecture. A great many of our Fellows—an appreciable number at any rate—were disappointed of entrance, but I hope all those who were have received tickets which will enable them to be present to-night. The fact is, this hall is lent to us by the London University, and is the only place at which our lectures can very well take place; but it will only hold a certain number, and when more come it must naturally overflow. As Captain Lugard generously consented to read his paper again, the Council hope that all difficulties are now arranged.

Captain Lugard then repeated his paper on

“A Journey from the East Coast to Uganda and the great Equatorial Lakes of Africa.”

After the reading of the paper the following remarks were made by Mr. H. M. STANLEY:—

If this were a political meeting I should have a great deal to say, but I must confine myself strictly to geographical talk. I have followed Captain Lugard with

excessive interest every step that he has described. I have to disagree with little or nothing that he has stated. I find that if I *had* wanted to discover what kind of man he was, his lecture would have enabled me to discover pretty clearly that he was very sociable, painstaking, and thoroughly human. All that he has stated in regard to these fine tribes on the plateau of Equatorial Africa, north of the Victoria Nyanza, and up to the Albert Edward and the Albert I heartily agree with. He brought to my mind very frequently in his description the Wahuma, the finest people in Africa physically, though the Waganda undoubtedly are superior to the Wahuma mentally. From the Cape to Cairo there are no finer people to be found than within that interlake region. I see that there is a little difference in the formation of the Albert Edward; instead of looking like a handleless teapot, it has turned out to be something resembling a narrow coffee-pot. He explains that he only took a compass with him, and I suppose if he added magnetic variation he would find the spout-like formation going further towards the west. Also the map-maker has done an injustice to Ruwenzori by putting down such a small dot for the Great Snowy Mountain. I see the Aberdare Range marked clearly, but Ruwenzori, really very much larger, is marked as a very small pin-point on the map. I quite understand, of course, that the map-maker intended only to illustrate the lecture; nevertheless, as some of you might go away with a wrong impression of its greatness and vastness, you should remember that three-quarters of the distance between those two lakes ought to have been occupied by Ruwenzori. I see also that Lake Victoria is gradually becoming more and more circumscribed; by-and-by I am afraid it will disappear altogether. It is not the first time that such freaks have taken place; for centuries the Mountains of the Moon have been dancing over the breadth of Africa, and I suppose some day they will begin to do so again. I thought I had anchored them steadfastly near 30° E. long. I am not at all disinclined to see Lake Victoria gradually becoming circumscribed, because in 1875—something like seventeen years ago—I was a young beginner in African exploration, and though I did spend two or three weeks in being taught the art of navigation, &c., which I had to practice daily, I bothered my head more about the east side of Lake Victoria than I have done upon any part of Africa since, and therefore I am quite ready to believe that I may be 10, 20, 50, or 100 miles even out of my way; but about Ruwenzori and the Albert Edward I stick fast to my guns; also about the course of the Congo and the latitudes of the north and south ends of Tanganyika I will not budge a hair's-breadth. I was very much interested, as I state, in hearing Capt. Lugard's address. I wish he had given us more of it. I would have infinitely preferred to have heard an enlarged description of these fine countries in Central Africa, and I should have wished he had curtailed a few descriptions of the tribes and routes towards the east. We should have had more, I may say, of the juice of Africa, for certainly if old Africa is to be saved at all, it is because of the merits and lands of the people of inner Africa, that is, those lying between the Western escarpment and its eastern face. You have heard him say how he passed through a tract of 250 miles waterless country east of Usoga. I doubt whether you will find a single square mile of waterless tract on the Interlake plateau, except near Lake Albert Edward, and that may be accounted for by the late recession of the Lake. In other things between Lake Albert Edward and Kavalli he has corroborated our discoveries. You can imagine then how very interested I was in hearing those descriptions, and it is a pleasure to me to have seen the second explorer of those regions. Captain Lugard has said that he did not care very much for the honour and glory of becoming an explorer, but he certainly has proved that he has not travelled without showing considerable merit. I hope that I may say one word or two without offending the instincts of geography manifested in this society. I

hope the words which Captain Lugard has addressed to this Society, to London, and to all England, will impress themselves upon the minds of the people, and that little by little we shall get the nation to share our deep, sincere and earnest sympathy with the condition of these Equatorial African peoples.

A vote of thanks to Captain Lugard was proposed by the Chairman, and carried unanimously.

Second Ordinary Meeting, November 28th, 1892.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., President, in the Chair.

PRESENTATION.—Miss Maria Eleanor Vere Cust.

ELECTIONS.—Arthur Rodolph Nunn Agassis; Alexander Armstrong; Rev. Francis Henry Baring, M.A.; Walter R. Durie Beckett; Mrs. Isabella L. Bishop; T. H. Browne; T. A. Bullock; Captain George Vernon Burrows (Indian Staff Corps); Alfred Richard Edward Burton; Samuel B. Burton; Albert F. Calvert; Rev. Jesse Carey; Captain Alfred E. J. Cavendish (1st Arg. and Suth. Highlanders); Joseph Charlesworth; Godfrey John Boyle Chetwynd; Percy Church; Mrs. Zelia Isabelle Colvile; Ernest Edward Cook; Thomas Albert Cook; Saxton Campbell Cory; Godfrey Michell Courage; Rev. Henry Thomas Cousins; Alfred Ernest Crawley, B.A.; The Right Hon. the Earl of Cromartie; Laurence Cussen; Miss Maria Eleanor Vere Cust; Otto Vernon Darbishire, B.A.; Miss S. Agnes Darbishire; John Delacour; Mrs. Cotterell Dormer; Lieutenant Philip Wylie Dumas, R.N.; Frederick Dutton; Viscount Falmouth, C.B.; George Frederic Gibson; George Godfrey Gray; J. Errol Gray; Frederic Hannam-Clark; Frank Arnold Harger; T. Sidney Hargreaves; Frederick Rutherford Harris; Andrew J. Herbertson; W. T. Hill-Cathrine; Theodore Hoffmann; Charles Hose; Alfred Jackson; Mrs. Jackson; Mrs. Beatrice Hope Johnstone; George Lawson Johnston; Henry Edward Joyce; James Johnston Keswick; John Kitching; Raphael Kuhe; Richard Lace; Herbert Lawton; Richard Cecil Leigh; J. Lightfoot; William May Lindsay; Reginald Livesay; James W. Lowther, M.P.; Mrs. Edward Maberly; Wallace Maclaren, M.A.; Miss Kate Marsden; Eduardo de Martino; Captain A. H. McMahon; Rev. W. A. Mill; Dr. Joseph A. Moloney; Mrs. Juliet Mylne; Captain Matthew Nathan, R.E.; Captain J. S. Nicholson (7th Queen's Own Hussars); Samuel Walter Norton; Thomas B. Nowell; Mrs. O'Connor; Major Edward Roderic Owen (Lancashire Fusiliers); Alfred Edward Pease; Lieutenant Cecil Pereira (Coldstream Guards); George S. Perrin; Lieutenant Arthur L. Pilleau (2nd Bombay Lancers); Mrs. Emmeline Porcher; Captain Powell (1st Ghooorkas); Charles John Poulett; Miss Christina Maria Rivington; William Henry Denham Rouse; Thomas Rouse; Thomas Rudd; Major William Charles Eldon Serjeant (Rifle Brigade); Mrs. French Sheldon; Henry Gustavus Simon; F. H. Smiles; G. C. Smith; George E. T. Smithson; Charles Soppit; William Stanford; John W. De Vere Stevens; William Stigand; Captain William Storm; Lieutenant H. W. Studd (Coldstream Guards); Paul Thiemé; Surgeon-Captain W. G. Thorold (Indian Med. Service); M. Tighe; Colonel Charles V. Verelst (Late Commanding 11th Hussars); Arthur T. Walker; John Claude White; L. Whitehouse; Major George Wingate (Bengal Staff Corps); Harold Richard Wintle; Rev. Alfred Cecil Wright; Lady Fox Young.

The paper read was:—

"To Lake Bangweolo and the Unexplored Region of British Central Africa." By Joseph Thomson.

Maps and photographs were exhibited in the tea-room.

Special General Meeting, November 28th, 1892.

This meeting was summoned by the Council by the following notice which was sent to all Fellows in Great Britain:—

A Special General Meeting of the Fellows will be held on Monday November 28th, at 4.30 p.m., in the Hall of the University of London, Burlington Gardens, W., for the purpose of revising the Rules of the Society in accordance with resolutions of the Council. It will be proposed to lower the Commutation Fee in the case of Fellows of long standing, and to raise the Entrance Fee to 5*l.* and the initial Life Commutation Fee to 35*l.*

DOUGLAS W. FRESHFIELD } *Hon. Secs.*
HENRY SEEBORN, }

The PRESIDENT: Before proceeding to our immediate business I desire to congratulate the Society upon the remarkable state of prosperity in which it finds itself. On the corresponding night of last year I was able to announce that seventy new members had been added to the Society, to-night I am able to announce that 109 new members have been added. I was able to say on the corresponding night of last year that there were nine new candidates for admission to the Society, to-night I am able to say that there are forty-one new candidates for admission to the Society. I think you will all consider that this is extremely satisfactory, and satisfactory chiefly for two reasons. The first reason is because in my annual address in the summer I had to announce that our losses by death had been most unusual. We therefore required an unusual accession to make up for these losses. There is another and very important reason for welcoming the inflow of new members. Our possessions of various kinds—our books, our maps and diagrams, and photographs—are growing so rapidly that we are in danger of being turned out of house and home. Before very long the officers of the Society will have to make some definite proposal about change of locality—change of locality which will undoubtedly involve considerable expense. It is within the knowledge, I suppose, of all present that the house No. 1, Savile Row, is our freehold property. Of course the first idea to occur to our minds was that it would be well to buy some of the adjoining property. We have tried to do so, but we have found it impossible, and if it were possible there is this further difficulty that at a period not at all distant, when talking of the life of a Society, it is more than probable that a street may be run through our present premises. That being so we have been led to look about in various directions. We applied to the late Government to help us, as it and its predecessors helped so many other scientific societies less directly useful to the State, by giving us a site, or, if unable to give us a site, then by selling us a site, or letting us a site, upon some reasonable terms. We do not by any means despair of sooner or later getting a favourable answer, but up to the present time we have not received such an answer. We have enquired as to the cost of property in Central London, as to the possibility of buying a site and raising a building on some of the leading thoroughfares not very far away from where we are now. I regret to say that we have found the probable expense greater than we had reckoned on. We are afraid that a site in one of the leading thoroughfares in the centre of the town, large enough to contain all that we want, including a hall (this hall, of course, is only lent us by the kindness of the University of London), would amount to a figure of not less than about £40,000. Then there would be the building, which must come to something very like the same figure. Altogether we should have to spend, if we remained in this part of the town, not less than £80,000—that is to say, we should have to expend twice our present property. The property of the Society, including the value of our present premises, but exclusive of their contents, is worth something like £40,000. These figures are not very encouraging. We are not yet in

a position to come before the Society with any definite proposal, and it is not necessary that we should do so at present; but the reason I mention these things is, first, that they have a bearing on any change we may make in reference to Chapter IV. of our Rules; and next, I want to take this opportunity of asking Fellows of the Society who may have influence to do all they can to try to bring it to bear on the Government, so as to induce it, if not to give us all we want—at least, to meet us half-way. If this prove ineffectual, I should ask them to consider and to communicate with us, not in any formal manner, but by conversation or letters, when the matter comes into their minds, as to whether they think we could, with advantage to the Society, go to any other part of the town where property is more easily acquired. These are the matters that I wish to mention of a preliminary character. The regular business, as you know, will be to go through these rules which you all have in your hands, and the history of our asking you to do so is this:—The rules have not been reprinted since the year 1879. In the thirteen years that have passed since that time, a number of small and very trifling variations have gradually been adopted in practice. These it is desirable formally to recognise; but the primary object of the meeting is to consider the resolutions of the Council with regard to raising the entrance-fee and commutation-fee on entrance, and introducing a graduated commutation-fee for the benefit of Fellows of long standing. The latter change is proposed in consequence of the frequent applications received from Fellows, and the Council believe that the financial changes they propose will, as a whole, give a reasonable boon to our senior members without risk to the resources of the Society. I will now put them to the Society in the form in which they are likely, I think, to give least trouble.

The alterations proposed were put, and carried.

The following is the new rule with regard to entrance and commutation fees:—

“Every Ordinary Fellow shall, on election, be required to pay £5 as admission fee, and £2 as first annual subscription, or may compound either at entrance [by one payment of £35, or at any subsequent period on the following basis:—

Fellows of 20 years' standing and over	£12 10s.
“ 15 “ “ and under 20	£16
“ 10 “ “ “ 15	£20

And no Fellow shall be entitled to vote or to enjoy any other privilege of the Society while in arrear. Honorary and Corresponding Fellows are not required to make any payments.”

Admiral SIR LEOPOLD M'CINTOCK enquired whether the question as to the election of ladies had already been decided by the Council, or whether it was to be placed before the meeting?

The PRESIDENT replied that no question about the admission of ladies was before the meeting. A certain number had been elected by the Council under the existing bye-laws and by virtue of the powers delegated to them by the charter.

Admiral SIR LEOPOLD M'CINTOCK argued that the admission of ladies involved a change in the constitution of the Society, and would not strengthen its geographical character and utility.

Mr. DOUGLAS FRESHFIELD, Hon. Sec., replied on behalf of the Council, pointing out that they had acted in the only way open to them under the terms of the Charter of the Society.

Admiral HALLIDAY CAVE spoke in support of Sir Leopold M'Cintock's argument.

Mr. R. N. CUST then proposed the following resolution: “That this meeting desires to associate itself with the gracious act of the Council in recognising the right of ladies to the Fellowship of the Royal Geographical Society.”

Mr. J. W. BATTEN seconded the resolution and Mr. H. M. STANLEY spoke in its support.

After some further remarks from Admiral Sir L. M'Clintock, the President explained that the question of the admission of Fellows was not technically before the meeting since it had been finally settled by the act of the Council, the power of which under the Charter was incontestable. The Council were now putting before the Society changes in the rules; their interpretation was a different matter, and lay with the Council. He thought that if there was any general feeling that he should not put Mr. Cust's motion, it would not be desirable to put it. He regarded it as an act of sympathy which Mr. Cust thought it would be agreeable to the Fellows present to perform under the existing circumstances. Mr. Cust was entitled to have his motion put, he thought, to the meeting, not as business, but as a matter of courtesy.

There voted for the motion 56, against 7.

Third Ordinary Meeting, December 5th, 1892.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., President, in the Chair.

ELECTIONS.—Captain Edward Agar, R.E.; Charles Wilgress Anderson; Augustus Charles Argles; Claude Askeu; Lieutenant H. H. Austin, R.E.; John William Bolton; Alfred Bonham-Carter; Percy M. Buchanan; Colonel Robert Bullock; Edward Litton Carus-Wilson, M.A.; Captain George Chenevix-Trench (Indian Staff Corps); W. H. Cozens-Hardy, B.A.; Captain Evens (4th Royal Fusiliers); John Frewin; Major George Edward Giles, R.A.; George E. Y. Gleadowe; Mrs. Lilly Grove; Frederick Cartwright Gubbins; Geoffrey Head; Colonel Frederick C. Henshaw (Victoria Rifles); Maurice Holtz; John Dudley Hoper; Colonel Edmund Hegan Kennard; Rev. Walter Lancelley; Robertson Lawson; Colonel Sir George Leach, K.C.B.; Frank Ledger; Arthur H. Lyell, M.A.; Lord Monkswell; E. Montague Nelson, J.P.; Rev. John W. Ogden; Francis William Percival, M.A.; Rev. Beresford Potter; Miss Florence M. Small; F. Heron Rolph; James Frederick Roberts; Morley Roberts; Lieutenant P. G. Twining, R.E.; Captain George Wemyss (West Yorkshire Regt.); George Maudsley Williams; A. F. Yarrow.

The papers read were:—

1. "Travels in a Portion of the Kalahari Desert." By E. Wilkinson.
2. "Journeys in the Benin Country, West Africa." By Captain H. L. Gallwey (H.M. Vice-Consul to the Oil Rivers Protectorate).

Fourth Ordinary Meeting, December 19th, 1892.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., President, in the Chair.

ELECTIONS:—John H. Fryday Brabner; William Burdett-Coutts, M.P.; James Crombie; Charles E. Hobhouse; Francis Blackburne Hopkins; Professor D. E. Hughes, F.R.S.; A. Joshua; Commander Henry Keane, C.M.G., R.N.; Arthur Ernest Spencer; F. C. in Thurn; J. C. in Thurn; Albert Henry Turton; James Wallis; John White; William Wilson.

The paper read was:—

- "Expedition up the Jub River, through Somali Land." By Commander F. G. Dundas, R.N.

A collection of curios, photographs, and maps was shown in the tea-room.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

EUROPE.

Danube.

Bigelow.

Paddles and Politics down the Danube. By Poultney Bigelow. London, &c., Cassell & Co., 1892: cr. 8vo, pp. 253. Price 3s. 6d. Presented by the Author.

An account of a canoe trip down the Danube, in the summer of 1891, with discussions of Danubian politics, illustrated by original sketches.

England—Winchelsea.

Inderwick.

The Story of King Edward and New Winchelsea. The Edification of a Medieval Crown. By F. A. Inderwick, Q.C. London, Sampson Low, Marston & Co., 1892: 8vo, pp. xiii. and 219.

The geographical position of Winchelsea is of great interest on account of the rapid extension of the shore in modern times, of which this attractive little book gives a good account in tracing the resulting historical changes.

Faroe Isles. *Deutsche Rundschau* 15 (1892): 21-27, 113-122.

Jiriczek.

Die Färöer. Von Dr. Otto Luitpold Jiriczek in Stockholm.

Dealing with the scenery, people, and language of the Faroe Isles.

France—The Causses. *Compt. Rend.* 115 (1892): 742-743. Martel and Gaupillat.

Sur la rivière souterraine du Tindoul de la Vayssière et les sources de Salles-la-Source (Aveyron), Note de MM. E. A. Martel et G. Gaupillat.

The source of the perennial and intermittent springs of Salles la Source has been traced to a great subterranean reservoir with restricted outlets on the underground course of the river of the Tindoul.

France—Caverns. *Revue de Geog.* 16 (1892): 355-362.

Martel.

La grotte de Saint-Marcel-d'Ardèche.

Continuation of M. Martel's underground explorations, with plans and sections.

France—Poitou. *Ann. Geog.* 2 (1892): 53-64.

Welsch.

Essai sur la Géographie physique du seuil du Poitou. Par Welsch, Professeur de Géologie à Poitiers.

The relation of the geography to the geology are explained by the aid of diagrams.

France—Seine. *Rev. Marit. et Colon.* 115 (1892): 560-580.

Dormoy.

Notions sur le Mascaret de la Seigne. Par M. Dormoy, chef du pilotage de la basse Seine.

A practical and theoretical discussion of the phenomena of the bore in the Seine.

France—Seine. *Ann. Geog.* 2 (1892): 27-45, with geological map.

Lemoine.

Etat actuel de nos connaissances sur l'hydrométrie du bassin de la Seine. Par Georges Lemoine.

M. Lemoine explains that hydrometry is the most exact form of hydrology, which is itself a more precise hydrography, and he summarises the hydrometrical conditions of the Seine with great ability.

Germany—Altmark. *Mitt. Verein Erdkund. Halle* (1892): 1-47.

Mertens.

Die südliche Altmark. Von Dr. A. Mertens in Magdeburg.

The physical geography of the district between the Elbe and the Harz.

No. I.—JANUARY, 1893.]

Germany—Baltic Lake-Ridge. *Ausland* 65 (1892): 673-676, 694-696, 710-713. **Ule.**
Die Seen des baltischen Höhenrückens. Von W. Ule.

Germany—Hartz Mountains. *Mitt. Verein. Erdkunde Halle* (1892): 150-172. **Kloos.**
Die Höhlen des Harzes und ihre Ausfüllungen. Von Prof. Dr. J. H. Kloos in Braunschweig.

Germany—Schleswig. *Peterm. Mitt.* 38 (1892): 256-259 (Map). **Langhans.**
Die Sprachenverhältnisse in Schleswig. Von Paul Langhans.
On the distribution of the Danish, German, and bilingual population of Schleswig.

Germany—Thuringia. *Mitt. Verein. Erdkunde Halle* (1892): 84-149. **Gröesler.**
Führer durch das Unstrutthal von Artern bis Naumburg für Vergangenheit und Gegenwart. Von Prof. Dr. Hermann Gröesler in Eisenach.

A specimen of minute local geography, only the upper half of the Unstrutthal, from Artern to Nebra, being described. Historical as well as topographical information is given regarding all the hamlets passed.

Greece. **Rodd.**
The Customs and Lore of Modern Greece. By Rennell Rodd, with 7 full-page illustrations by Tristram Ellis. London, David Stott, 1892: 8vo, pp. xvi. and 294.

Mr. Rodd's Modern Greece is that of the rural villages where there yet linger traces of ancient ways and thoughts, and where the Europeanising tendency has not yet reached. It is a book of peculiar charm and interest.

Montenegro. *Nouv. Geog.* (1892): 177-181. **Lelarge.**
Le Lac de Scutari et la Boiana. G. Lelarge.

Contains a short account of the coast region of Montenegro, with remarks on the best site for establishing a sea-port.

Moravia. *Bul. Soc. Geog. Lyons* 11 (1892): 177-189, 213-230. **Proskowetz.**
La Moravie. Par Max de Proskowetz.

A monograph on the geography of Moravia.

Norway—Norrländ. *Norsk. Geog. Selsk. Arbog* 3 (1891-92): 71-86. **Rekstadt.**
Om Svartisen og dens gletschere. Cand. real. J. Rekstadt.

An account of the glaciers of the Svartisen plateau, with a map.

Russia. *Tour du Monde* 64 (1892): 289-362. **Rabot.**
Exploration dans la Russie Boréale (La Petchora, L'Oural, La Sibérie). Par M. Charles Rabot.

A popular and richly illustrated narrative of a journey in Northern Russia undertaken in 1890 by a French scientific mission.

Russian Fauna. *Ausland* 65 (1892): 727-731, 742-745. **Nehring.**
Die geographische Verbreitung der Säugetiere im östlichen Russland und ihre Bedeutung für die mittel-europäische Diluvialfauna. Von A. Nehring (Berlin).

An endeavour to throw light on the mammalian fauna of pre-glacial or interglacial Europe by the study of the existing distribution of animals in Russia.

Scandinavia. *Norsk. Geog. Selsk. Arbog* 3 (1891-92): 34-56. **Vogt.**
Om istiden under det ved de lange norsk-finske endemorsener markerede stadium. Professor J. H. L. Vogt.

On the action of the ice-sheet in modifying the surface features of Norway, Sweden, and Finland.

Sicily.**Freeman.**

Sicily; Phœnician, Greek, and Roman. By Edward A. Freeman. London, T. Fisher Unwin, 1892: 8vo, pp. xvi. and 378. *Map and illustrations.* Price 5s.

This forms Vol. 31 of "The Story of the Nations" Series. In the first chapter Professor Freeman deals with the characteristics of Sicilian history in which he points out how the geographical position of the island has affected its past history. The volume consists of a short history of Sicily from the earliest days of the Greek colonisation down to the time when it was made a Roman province.

ASIA.**Apcheron.**

Ausland 65 (1892): 713-718, 731-734, 745-748.

Stern.

Ein Besuch an den Naphthaquellen auf Apscheron. Von Bernhard Stern (Wien).

A careful account of all aspects of the mineral oil industry at Baku.

Borneo.**Posewitz.**

Borneo, its Geology and Mineral Resources. By Dr. Theodor Posewitz. Translated from the German, by Frederick H. Hatch, Ph.D. London, Edward Stanford, 1892: Roy. 8vo, pp. xxxii. and 495. Price 14s.

The German original of this translation was noticed in the *Proceedings* for 1889, p. 512. The present edition is well prepared, and on account of its numerous maps, and the references to Dutch literature, it is the most complete treatise on Borneo in English.

Burma.**MacMahon.**

Far Cathay and Farther India. By Major-General A. Buxton MacMahon. London, Hurst & Blackett, 1893 [1892]: 8vo, pp. xii. and 340. *Illustrations.* Price 12s. Presented by the Author.

The author, who has resided for over twenty-five years in Farther India, has here brought together a collection of notes, supplemented by extracts from articles contributed to various periodicals and mainly relating to Burma. The volume largely deals with the people, including the Burmese, the Talaings and Arakanese, the Shans, the Karens, Chino-Burmese border tribes, and Indo-Burmese border tribes; there are also chapters in which the politics, history and commercial capabilities of the country are somewhat fully discussed.

Caucasus—The Tats. *Bul. Soc. Anthropol. Lyon* 10 (1891): 72-82.

Chantre.

Les Tats de la vallée inférieure de la Koura. Par Ernest Chantre.

Description of the Tats or Tajiks inhabiting the shores of the Caspian between Derbent and the mouth of the Kura.

Ceylon.

Journ. Roy. Asiat. Soc., Ceylon 11 (1889): 233-314.

Saar.

Johann Jacob Saar's Account of Ceylon, 1647-1657. Translated by Ph. Freudenberg.

A quaint and racy account of Ceylon during the contest for supremacy between the Dutch and Portuguese, with many curious details of native life and customs.

China.

Deutsche Rundschau 15 (1892): 106-113.

Krebs.

Dürren, Nothstände, Unruhen in China. Ein Beitrag zur Frage der politischen Kompetenzen der Klimatologie. Von Wilhelm Krebs.

A map showing the areas of drought and of social disturbance in China brings out certain correspondences which the author claims to be related as cause and effect.

India—Ganges Delta. *Journ. Asiat. Soc., Bengal* 61 (1892): 109-117.

Wilson.

Note on the Topography of the River in the 16th century from Hugli to the Sea, as represented in the *Da Asia* of De Barros. By C. R. Wilson.

- Indo-China.** *Ann. Geog.* 2 (1892): 97-100. **Guillot.**
 La France au Laos. Par E. Guillot.
 Account of the origin and spread of French influence on the Upper Mekong.
- Oxus.** *Ausland* 65 (1892): 705-710. **Komischke.**
 Das alte Bett des Oxus. Von W. Komischke.
 A summary of the evidence as to the former course of the Amu-darya. See p. 59.
- Persia—Demavend.** *Verhandl. Gessell. Erdkunde, Berlin* 19 (1892): 304-332. **Hedin.**
 Der Demavend nach eigener Beobachtung. Von Sven Hedin.
 See *Proceedings*, 1892, p. 565. There are full references to previous climbers.
- Persia—Deserts.** *Deutsche Rundschau* 15 (1892): 49-59. **Buhse.**
 Die grosse persischer Salzwüste und ihre Umgebung. Von Dr. F. Buhse.
 This paper is accompanied by a map of the great salt deserts of Persia, showing the routes of Buhse in 1849, Vaughan in 1887, and Christie in 1810.

AFRICA.

- African Lakes.** *Globus* 62 (1892): 321-325. **Sieger.**
 Das gegenwärtige Sinken der grossen afrikanischen Seen. Von Dr. Robert Sieger, Wien.
 Summarising the recent observations on the desiccation of the great African lakes, and urging the importance of more systematic observations of water-level than have hitherto been made.
- Algiers.** **Harris.**
 "The" Practical Guide to Algiers. By George W. Harris. Third edition. London, G. Philip & Son, 1893 [1892]: 12mo, pp. xix. and 176, maps, plan, and illustrations. Presented by the Publishers.
- Egypt—Fayûm.** **Brown.**
 The Fayûm and Lake Moeris. By Major R. H. Brown, R.E. With a Prefatory Note, by Colonel Sir Colin Scott-Moncrieff, K.C.M.G., C.S.I., and Illustrations from Photographs by the Author. London, E. Stanford, 1892: 4to, pp. vii. and 110. Price 10s. 6d. Presented by the Publisher.
 This book will be found reviewed on p. 51.
- French Congo.** *Bul. Soc. Geog. Comm., Havre*, 1892: 208-231, 257-271. **Blim.**
 Le Congo Français. Par E. Blim.
 A physical, historical and commercial description of the French Congo Territory.
- French West Africa.** *Tour du Monde* (1892): 225-288. **Porcher.**
 Voyage dans l'Adamawa, par le lieutenant de vaisseau L. Mizon. Par Harry Alis [H. Porcher].
 Numerous illustrations of scenery and natives of Adamawa accompany the text.
- German East Africa.** *Mitt. Forsch. Deutsch. Schutzgebiete* 5 (1892): 101. **Stuhlmann.**
 Aus dem deutsch-ostafrikanischen Schutzgebiete.
 Reports of Dr. Stuhlmann's and Father Schynse's journeys between the coast and the Victoria Nyanza, with tables of position, altitude, &c.
- German South-West Africa.** *Deutsch. Kolonialzeit.* V. (1892): 151-153. **Dove.**
 Von Walffischbai nach Otjinbingue. Von Dr. Karl Dove.

Madeira.**Marsh.**

Holiday Wanderings in Madeira. By A. E. W. Marsh. London, Sampson Low & Co., 1892: 8vo, pp. xii. and 180, *illustrations*. Price 3s. Presented by the Publishers.

Nyasaland.*Peterm. Mitt.* 38 (1892): 249-356 (*Map*).**Wichmann.**

Die deutschen Missionsunternehmungen im Njassa-Gebiet. Von H. Wichmann.

Reunion.*Revue Française* 16 (1892): 418-431.**Lacaze.**

Souvenirs Créoles de Bourbon. Par le Docteur H. Lacaze.

Interesting details regarding the more important physical features of Reunion.

Sudan.**Wingate.**

Ten Years' Captivity in the Mahdi's Camp, 1882-1892. From the original manuscripts of Father Joseph Ohrwalder, late Priest of the Austrian Mission Station at Delen in Kordofan. By Major F. R. Wingate, R.A. With maps and illustrations, by Walter C. Horsley. London, Sampson Low, Marston & Co., 1892: 8vo, pp. xv. and 460. Price 21s. Presented by the Publishers.

This is a thrilling narrative of events in the Mahdi's camp during the period of his greatest success, and a record of the subsequent decay of the Mahdist power under the reckless government of the Khalifa. Father Ohrwalder and two sisters of the Austrian Mission survived their imprisonment for ten years, and were at length rescued by an Arab guide sent across the desert from Egypt. The book throws great light on the character of the Baggaras, the tribe of river Arabs who formed the nucleus of the Mahdi's hosts.

Uganda.**Foster.**

Uganda. Notes on the Geography, Government and Inhabitants of Uganda, with a sketch of its history to 1892. By Captain Hubert Foster. Pp. 7. Prepared in the Intelligence Division of the War Office, September 1892. Presented by the Intelligence Division.

Uganda.**Smith.**

Uganda. Two Letters to 'The Times.' By R. Bosworth Smith. London, &c., Cassell & Co., 1892: 8vo, pp. 16. Price 2d. Presented by the Author.

Windhoek.*Deutsch. Kolonialblatt* 3 (1892): 523.

Ueber die Ansiedelungen in Windhoek.

Brief notice, with large scale map, of the new German settlement of Windhoek, inland from Walffisch Bay.

Zambia.*Scot. Geog. Mag.* 8 (1892): 569-579.**Rankin.**

Explorations in the Leangwa-Zambesi Basin. By Daniel J. Rankin.

NORTH AMERICA.**Canada—Cape Breton.** *Trans. Roy. Soc. Canada*, 1891, *Sect. II.*: 173-343. **Bourinot.**

Cape Breton and its memorials of the French Régime. By J. G. Bourinot.

A comprehensive account of the history and historical geography of Cape Breton Island (Ile Royale). With maps.

Chicago.

Rand, McNally & Co.'s Handy Guide to Chicago and World's Columbian Exposition. Chicago and New York, Rand, McNally & Co., 1892: 12mo, pp. 219, *illustrations*. Presented by the Publishers.

This little volume has been prepared for the use of visitors to Chicago, and to its forthcoming exhibition. It describes the various sights of the city, and contains chapters on its educational and other institutions, art and architecture, monuments,

etc., with a special chapter on the World's Columbian Exposition. An excellent plan of Chicago is given at the end of the volume.

Newfoundland—Beothiks. *Trans. Roy. Soc. Canada*, 1891, *Seet. II.*: 123. **Patterson.**
The Beothiks or Red Indians of Newfoundland. By the Rev. George Patterson, D.D.

The Beothiks became extinct in 1829, and Dr. Patterson has in this memoir put together all the references to the race which appeared likely to be serviceable in giving a correct description of them. In many respects they seem to have been more gentle and intelligent than the other Red Indian races.

Canada—Shuswaps. **Dawson.**
Notes on the Shuswap People of British Columbia. By George M. Dawson, LL.D., F.R.S. *Reprint from Trans. Roy. Soc. Canada*, 1891: 4to, pp. 44 (*Map*).

Santo Domingo. *Bul. Soc. normande de Géog.*, 1892: 168-188. **Bréard.**
Notes sur St.-Domingue tirées des papiers d'un armateur du Havre (1780-1802). Par M. Ch. Bréard.

Interesting notes on the period preceding the formation of the Republic of Haiti.

United States and Canada. **Appleton.**
Appleton's General Guide to the United States and Canada. Illustrated. With Railway Maps, Plans of Cities, and Table of Railway and Steamboat Fares. Edinburgh, A. and C. Black, 1892: 12mo, pp. xvi. and 602. Price 10s. 6d.

This work covers a very wide area. Among the new features of the present edition may be mentioned:—Descriptions of routes, resulting from increased railroad facilities; descriptions of resorts, notably those on the Pacific Coast; the latest information concerning each of the leading cities, by some special expert; itineraries of each of the larger cities; new plans, maps, and illustrations.

SOUTH AMERICA.

Amazons. *Revist. Soc. Geog. Rio de Janeiro* (1891): 161-179. **Tapajoz.**
As correntes do Amazonas e o phenomeno da Peroroca. Dr. Torquato Tapajoz.

Description of the currents of the Amazons, and examination of the opinions and observations of Buffon, Condamine, Bumsel, Humboldt, Lartigue, Mav, Tardy de Montivell, Ennes de Sousa, Baron de Ladario, and Aguiar Lima, on the tidal floods of the Ganges (*Bore*), Seine (*Mascaret*), Gironde, Thames, and Severn, with special application to the *Peroroca* of the Amazons and other rivers of the north-east coast of Brazil and Guiana, with some legends connected therewith.

Amazons. *Bol. Soc. Geog. Madrid* 33 (1892): 24-79. **Espada.**
Noticias autenticas del famoso rio Marañon, por D. Marcos Jimenez de la Espada.

The last part of a long series of articles summarising the early documents regarding the discovery and exploration of the Amazons.

Amazons Tribes. *Globus* 62 (1892): 1, 33, 70, 100, 133, 181, 214, 259, 326. **Ehrenreich.**
Südamerikanische Stromfahrten. Von Dr. Paul Ehrenreich, Berlin.

American History. **Payne.**
History of the New World called America. By Edward John Payne. Vol. I. Oxford: Clarendon Press, 1892: Roy. 8vo, pp. xxviii. and 546. Price 18s. Presented by the Delegates of the Clarendon Press.

This volume treats in a scholarly and philosophical manner of the early history of America, including its discovery by the Northmen and by Columbus. Fully half the work is devoted to an account of the primitive social conditions of American nations. In this much new light is thrown on the relation between land and people

in Mexico and Peru, the author bringing to bear on the problem the new theory that in primitive peoples advancement has "no loftier origin than the organised provision of the food supply on an artificial as distinguished from a natural basis."

Andes. **Hettner.**

Die Kordillere von Bogotá. Von Dr. Alfred Hettner. Gotha, Justus Perthes, 1892. Imp. 8vo, pp. 131, *maps and illustrations*. Price 6 marks.

This work on the Andes of Bogotá is *Ergänzungsheft* No. 104 of *Petermann's Mittheilungen*. See *Proceedings*, 1892, p. 850.

Argentina. *Bol. Inst. Geog., Argentino* 13 (1892): 168-180. **Ambrosetti.**

Rápida ojeada sobre el territorio de Misiones. Por Juan B. Ambrosetti.

Detailed description of the territory of Misiones at present under dispute between the Argentine Republic and Brazil.

Brazil. *Revist. Soc. Geog. Rio de Janeiro* (1891): 81-91. **Villerooy.**

Apontamentos sobre a Linguagem dos Indios Coroados-Bororó.

A grammatical classification of vocabularies of the languages spoken by the Bororó Indians in Matto Grosso and Goyaz (Brazil), collected during the exploration of the Paranatinga River.

Chile. *Notes de la Société Scientifique du Chili, Santiago*, 1892: xlii.-xliv. **Nogues.**
Moraines et Glaciers de la Cordillère de Chillan.

Discovery. *Zelts. Gesells. für Erdkunde, Berlin* 27 (1892): 153. **Gelcich.**

Zur geschichte der Entdeckung Amerikas durch die Skandinavien. Von Eugen Gelcich.

A full account of the part played by the Northmen in discovering the American continent, and an enquiry into the probability of the reports of this discovery determining the voyage of Columbus.

Historical. *Ann. Geog.* 2 (1892): 65-91. **Gallois.**

Etat de nos connaissances sur l'Amerique du sud. Par L. Gallois, professeur de Lyon.

A useful summary with copious references.

Honduras, British. **Bristowe.**

The Handbook of British Honduras for 1892-93, comprising historical, statistical, and general information concerning the Colony. By Lindsay W. Bristowe. Edinburgh and London, W. Blackwood and Sons, 1892: large 8vo. pp. xii. and 275, *map*.

Paraguay. **Bourgade la Dardye.**

Paraguay: the Land and the People, Natural Wealth and Commercial Capabilities. By Dr. E. de Bourgade la Dardye. London, G. Philip & Son, 1892: cr. 8vo, pp. xiii. and 243. *Map and illustrations*. Price 7s. 6d. *Presented by the Publishers.*

The original edition of this work was published in 1889, and noticed in the *Proceedings* for 1890, p. 642. The present translation has been edited by Mr. E. G. Ravenstein.

AUSTRALIA AND PACIFIC ISLANDS.

Kei Islands. *Globus* 62 (1892): 314-316. *With map.* **Planten.**

Planten's Erforschung der Key-Inseln.

Results of the exploration of this group in the Banda Sea by Lieutenant Planten of the Dutch navy in 1889-90. They are coral islands, producing iron-wood, sago, maize, and coconuts, and have a population of about 23,000.

Magnetic Shoal. *Proc. Roy. Soc. Victoria* 4 (1892): 65-68. **Ellery.**

The Magnetic Shoal near Bezout Island, off Cossack, North-west Coast of Australia. By R. L. J. Ellery.

Brief report of the submarine bank in $20^{\circ} 32' 35''$ S. and $117^{\circ} 13' 2''$ E., where a deflection of the compass of 56° was observed.

New Guinea. **Thomson.**

British New Guinea. By J. P. Thomson. London, George Philip & Son, 1892: Roy. 8vo, pp. xviii. and 336. With map. Price 21s. Presented by the Author.

A brief historical sketch is followed by a somewhat detailed account of recent exploration in British New Guinea, principally the work of Sir William MacGregor. Appendices are given by various specialists on the geology, flora, insects, reptiles, and languages, of New Guinea. There are several illustrations.

Polynesian Languages. **Macdonald.**

South Sea Languages. A Series of Studies on the Languages of the New Hebrides, and other South Sea Islands. By the Rev. D. Macdonald. 2 vols. Melbourne, 1889-1891: 12mo, pp. 134.

Vol. I. contains Studies on the Languages of Efate, Eromanga, and Santo. Vol. II. contains Introductory Comparative Notes, and Studies on the Languages of Tongoan—Santo, Malo, Malekula, Epi (Baki and Bierian), Tauna and Futuna.

Travels. **Baden-Powell.**

In Savage Isles and Settled Lands, Malaysia, Australasia, and Polynesia, 1888-1891. By B. F. S. Baden-Powell. London, Richard Bentley & Sons, 1892: 8vo, pp. x. and 438. Map and illustrations. Price 21s.

A pleasantly written record of passing visits to the Australian Colonies, New Guinea, Batavia, Sarawak, Samoa, and a trip round the world. The remarks on places and people are always good-humoured and kindly, although of course there is little in them that is new.

Voyage. **Dewar.**

Voyage of the *Nyanza*, R.N.Y.C. Being the record of a three-years' cruise in a schooner-yacht in the Atlantic and Pacific, and her subsequent shipwreck. By J. Cumming Dewar. Edinburgh, William Blackwood & Sons, 1892: 8vo, pp. xviii. and 466. Map and illustrations. Price 21s. Presented by the Publishers.

The *Nyanza* sailed from Plymouth Sound on July 21st, 1887, visited Fernando Noronha and other islands, passed through Magellan's Strait, coasted along South America to Callao, crossed the Pacific, calling at Easter Island, to New Caledonia; then by the Sandwich Islands to San Francisco and Vancouver, thence to Japan and Kamchatka, and south again to Panapi, where she was wrecked on a coral reef on July 29th, 1890.

POLAR REGIONS.

Greenland. **Nansen and Mohn.**

Wissenschaftliche Ergebnisse. Von Dr. F. Nansens Durchquerung von Grönland, 1888. Gotha, Justus Perthes, 1892. Imp. 8vo, pp. 112.

Ergänzungsheft, No. 105 of *Petermann's Mittheilungen*. Part I. is occupied by a discussion of the astronomical, mathematical, trigonometrical, and meteorological observations by Professor Mohn. Part II., by Dr. Nansen, gives a full discussion of the geological and hydrographical work. There are appendices on the mud from the coast ice by Dr. Törnebohm, and on the carbonic acid in the air by Dr. Otto Petterson. The memoir is fully illustrated by maps and diagrams.

Jan Mayen. *Norsk. Geog. Selsk. Arbog.* 3 (1891-92): 57-70. **Mohn.**

Øen Jan Mayen. Professor H. Mohn.

An account of Jan Mayen, illustrated by seven full-page views of the island and four maps.

- Spitzbergen.** *Comptes Rendus* 115 (1892): 683-687. **Bienaimé.**
 Résumé succinct des résultats du voyage du transport-avis la Manche en Islande, à Jan Mayen et au Spitzberg pendant l'été de 1892. Par le Capitaine Bienaimé.

An epitome by the commander of the expedition of the scientific results ascertained in Jan Mayen and Spitzbergen by Professor Pouchet, M. Rabot, and others. The work comprises exploration, study of glaciers, tides, magnetic conditions, the value of g , and natural history collections.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

- Continental Outlines.** *Science* 20 (1892): 282-284. **Parker**
 Origin of the Lines of Mars. By Professor Henry W. Parker.

A comparison of the maps of Mars and the Earth resulting in the opinion that in both cases the form of the main continental lines was due to the action of lunar and solar tides in the viscous spheroid.

- Estuaries.** *Revue Geog.* 16 (1892): 345-354. **Girard.**
 Caractères des estuaires. Par M. J. Girard.

This instalment of M. Girard's geography of the sea margin is defective in taking account neither of Osborne-Reynolds' valuable experimental work on estuaries, nor of the fairly complete physical surveys which have been made on the estuary of the Forth and the Clyde Sea Area and to some extent on the Thames.

- Geodesy.** *Compt. Rend.* 115 (1892): 706-708. **Bassot.**
 Sur la nouvelle Méridienne de France.

A preliminary note on the conclusion of the re-measurement of the arc of the meridian, commenced in 1870. See note, p. 71.

- Geodesy.** *Journ. Franklin Inst.* 134 (1892): 358-366. **Gore.**
 How the Earth is Measured. By Prof. J. Howard Gore.

A popular exposition of the principles of Geodesy.

- Geodesy.** *Cosmos* 11 (1892): 20-27, 50-63, 105-121. **Mallino.**
 Il valore metrico del Grado di Meridiano secondo i geografi Arabi.
 C. A. Mallino.

A laborious and apparently exhaustive enquiry into the length of a degree of the meridian as estimated by the early Arabian geographers.

- Maps.** *Bol. Soc. Geog. Italiana* 5 (1892): 681-740. **Botto.**
 Progressi fatti negli ultime tempi dalla Cartografia nei vari Stati di Europa e più specialmente in Italia. Relazione del ten. colonnello del genio A. Botto.

An account of the principal official maps produced by the Governments of the following European countries:—Austria-Hungary, Belgium, Denmark, France, Germany, Great Britain, Italy (in great detail), Holland, Portugal, Rumania, Russia, Spain, Sweden and Norway, Switzerland.

- Photo-topography.** *Bol. Soc. Geog. Italiana* 5 (1892): 658-675. **Paganini.**
 Del rilevamento fototopografico. Relazione dell'ingegnere P. Paganini.

On the use of photography in surveying and mapping as applied in Italy.

GENERAL.

Bow and Arrow.

Ausland 65: 689-694.

Schmeltz.

Ueber Bogen von Afrika und Neu-Guinea. Von J. D. E. Schmeltz.

An ethnographical article, discussing the use of the bow and arrow amongst the natives of Africa and New Guinea.

Columbus.

B. A. V.

Qui a imprimé la première lettre de Christoph Colomb. [B. A. V.] Extrait du 'Centralblatt für Bibliothekswesen,' 1892, III. Leipzig, Otto Harrasowitz, 1892: 8vo, pp. 20. *Presented by the Author.*

Columbus.

Chagas.

Os Descobrimentos Portuguezes e os de Colombo. Tentativo de Coordenação Histórica. Por Manuel Pinheiro Chagas, Secretario Geral da Academia Real das Sciencias de Lisboa. Lisboa, 1892: 8vo, pp. 244. *Presented by Mr. Batalha Reis.*

Columbus.

Duquesa de Berwick y de Alba.

Autografos de Cristobal Colon y Papeles de America. Los publica La Duquesa de Berwick y de Alba, Condesa di Siruela. Madrid, 1892: Fol. pp. v. and 203. *With facsimile autograph letters. Price 14s.*

Columbus.

Elton.

The Career of Columbus. By Charles J. Elton, F.S.A. London, Cassell & Co., 1892: 8vo, pp. xii. and 307. Price 10s. 6d. *Presented by the Publishers.*

Columbus.

Lazzaroni.

Cristoforo Colombo. Osservazioni critiche sui punti più rilevanti e controversi della sua vita. Pubblicate per cura di M. A. Lazzaroni Con disegni di L'eramo Rossi Scotti e figure di Cose e Monumenti Colombiani. Milano, Fratelli Treves, 1892: 4to, 2 vols., pp. 446 and 392. Price 14s.

Columbus.

Lollis.

Cristoforo Colombo nella Leggenda e nella Storia. Di Cesare De Lollis. Milano, Fratelli Treves, 1892: 8vo, pp. 377. *Presented by the Italian Geographical Society.*

Columbus.

Markham.

Life of Christopher Columbus. By Clements R. Markham, c.n. (The World's Great Explorers and Explorations Series). London, G. Philip & Son, 1892: 8vo, pp. 375. Price 4s. 6d. *Presented by the Publishers.*

The foregoing and other volumes called forth by the Columbus celebrations in various countries will form the subject of a special review.

Columbus.

Verhand. Gesell. Erdkunde Berlin 19 (1892): 401-421.

Kretschmer.

Christoph Columbus als Kosmograph. Von Herr Dr. Konrad Kretschmer.

An important contribution to the literature of the Columbus centenary.

Columbus.

Bol. Soc. Geog. Madrid 33 (1892): 7-23.

Neussel.

Investigaciones que demuestran que la isla Watlin es la isla Guanahani, llamada por Christobal Colon San Salvador, y que fué la isla primera que descubrió y visitó el gran navegante, por Otto Neussel.

Proofs as to the identity of Watling Island with Columbus' landfall. With map of the voyages of Columbus.

Columbus.

Deutsche Rundschau 15 (1892): 1-9, 71-79.

Ruge.

Die Familie des Columbus. Von Dr. Sophus Ruge.

- Desert Life.** *Oest. Monats. für Orient.* 18 (1892): 97-103, 109-117. **Josaphat.**
 Wüste und Wüstenvolk. Von Don Josaphat.
 Characteristics of the wandering Arab tribes.
- Diogo Cão.** *Bol. Soc. Geog. Lisboa* 11A Ser. (1892): 90-155. **Cordeiro.**
 Descobertas e Descobridores. Diogo Cão. By Luciano Cordeiro.
 Biographical notice of the early African explorer, with illustrations showing the pillars erected by him on the Coast of Africa.
- History of Discovery.** *Deutsch. Geog. Blätt.* 15 (1892): 214-234. **Gelcich.**
 Die Bedeutung Dispees im Zeitalter der grossen Länder-Entdeckungen.
 Von Eugen Gelcich.
 Narrative of the part taken by Dieppe sailors in geographical discovery during the fifteenth and the beginning of the sixteenth centuries.
- Maps.** *Zeits. Gesell. Erdkunde, Berlin* 27 (1892): 221-247. **Bludau.**
 Flächentreue Gradnetz-Projektionen für die Karten von Süd- und Nord-Amerika und Australien. Von Dr. Alois Bludau.
 Full details with tables of coordinates and outline maps for the construction of maps on an equivalent area gnomonic projection.
- Mediterranean Health Resorts.** **Ball.**
 Mediterranean Winter Resorts; a practical Handbook to the principal Health and Pleasure Resorts on the shores of the Mediterranean. . . . Edited by E. A. Reynolds Ball. Second edition. London, E. Stanford, 1892: 12mo, pp. xiv. and 336. Map and illustrations. Presented by the Publisher.
 In the present edition, which has been enlarged, several new and important features have been introduced. Greater prominence has been given to the medical aspect of the principal invalid resorts, and special articles dealing with the climatic, sanitary, and general hygienic conditions of these places, have been contributed by resident English physicians. Another new feature is the introduction of detailed descriptions of the newer health resorts, such as Biskra, Luxor, Helwan in North Africa; St. Raphael, Grasse, Beaulieu, Ospedaletti on the Riviera; and Torre del Greco, Castellamare, and Amalfi on the South Italian Littoral.
- Mountains.** *Bul. Soc. Anthropol. Paris* 3 (1892): 221-237. **Regnault.**
 Du rôle des montagnes dans la distribution des races. Par Felix Regnault.
 Discussion of the effect of mountain ranges on the distribution of races.
- Obituary.** *Ausland* 65 (1892): 753-754. **Höfler.**
 Friedrich von Hellwald. Von M. Höfler (Tölz).
 Brief biographical notice, with list of works. A notice with portrait also appears in *Globus* 62 (1892): 349-350.
- Obituary.** *Ausland* 65: 721-723. **Wolkenhauer.**
 Arthur Breusing. Von W. Wolkenhauer (Bremen).
 A summary of the work of this distinguished cartographer.
- Sport.** **Buxton.**
 Short Stalks; or, Hunting Camps, North, South, East and West. By Edward North Buxton. London: Edward Stanford, 1892: 8vo, pp. xiii. and 405. Numerous illustrations. Price 21s. Presented by the Publishers.
 Mr. Buxton has illustrated his book with a set of highly-finished wood-engravings which make the scenes of his hunting-camps very vivid to the reader. His range is wide, including mountain-hunting in the Alps, Pyrenees, and Rocky

Mountains, trips into the Sahara on the South, and the northern plain of Scandinavia. Nothing could be better of its kind than his descriptions of scenes and characters. The work is of high literary merit.

Time-reckoning.

Lullin.

Institution d'un Méridien Central Unique et d'une heure universelle avec maintien de l'heure locale. Par E. I. Lullin, Ingénieur. *Genève, Imprimerie Suisse*, 1892: 8vo, pp. 40. *With two maps.*

Toscanelli.

Uzielli.

Paolo dal Pozzo Toscanelli, Iniziatore della Scoperta d'America. Ricordo del Solstizio d'Estate del 1892. Firenze, Loescher & Seeber, 1892: 8vo, pp. 247. *Presented by the Author*

NEW MAPS.By J. COLES, *Map Curator, R.G.S.***EUROPE.****Germany.**

Langhans.

Die Reste des Frisischen Sprachgebiets im Deutschen Reich, Nach den neuesten Forschungen entworfen u. gezeichnet von Paul Langhans. Scales 1:200,000 (or 2·7 geographical miles to an inch); and 1:400,000 (or 5·5 geographical miles to an inch). *Petermann's Geographische Mittheilungen*, Jahrgang, 1892. Tafel 20. Justus Perthes, Gotha, 1892. *Presented by the Publisher.*

Great Britain.

Ordnance Survey.

Publications issued since November 15th, 1892.

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ASIA.**Indian Government Surveys.**

Surveyor-General of India.

Indian Atlas, 4 miles to an inch. Sheets: 40, Parts of Districts Ratnagherri, Sholapur and Satara and Kalapoor Native State (Bombay Presidency). 74, Parts of Districts Yelgandol, Indur, Medak, Sirpur, Tandur, and Khammamet (Nizam's Dominions), District Chanda and Native State Bastar (Central Provinces). Quarter Sheets: 105, S.E. Parts of Lohar-

dugga, Gangpur Bonai, and Singhbhoom (Chola Nagpore of Jaipur and Banra (Central Provinces), and of Keonjhar (Orissa). 115, Parts of Districts Balasore, Cuttack and Midnapore, and of Mayurbhanja, Keonjhar, Dhenkanal Hindol, Bonai Lahara, Tigiria and Baramba Tributary States of Orissa (Bengal). 130, S.E. Parts of District Naga Hills, Manipur Native State and of Naga Tribes (Assam).—Eastern Bengal, 8 miles to an inch. Sheet No. 14, Hooghly, Howrah. 24, Pergunnahs, Khoolna, Bacherunge, Noakholly, and Sundarbana. Sheet No. 15, containing Parts of Districts Tipperah, Noakholly, Chittagong, Chittagong Hill Tracts, and Native State Hill Tipperah.—Madras Survey, 1 inch to a mile: No. 151, Part of District Madura. Seasons 1879-88.—Central Provinces Survey, 1 inch to a mile. Seasons 1864-66 and 1869-70. Sheet No. 82, Parts of District Damah (Central Provinces), and of Panna, Ajaigar, and Bijawar States (Central India Agency). Seasons 1864-66 and 1869-70.—Madras Survey, 1 inch to a mile. Sheet No. 151, Part of District Madura. Seasons 1879-88.—Bombay Survey, 1 inch to a mile. Sheet No. 185, Parts of Baroda, Rewa Kautha Agency, and Khandesh District. Season 1889-90. No. 255, Parts of Districts Kandesh and Nisik. Seasons 1874-76 and 1878-81.—North-west Provinces and Oudh Survey, 1 inch to a mile. Sheet No. 176 (Preliminary Edition), District Basti (with Overlap of District Fryzabad. Seasons 1884-86.—Bengal Survey, 1 inch to a mile. Sheet No. 5, Parts of Rowah Native State (Central India Agency), and of Poreia Tributary State, Chola Nagpore (Bengal). Seasons 1868-69 and 1871-72. No. 363, Districts Mymensingh and Dacca. Seasons 1850 to 1854 and 1857-58.—Bengal Survey (District 24 Purgunnatis). Sheet No. 5, additions of Railway, 1892.—Bengal Survey (Districts Hooghly and Howrah), 1869-73, 1 inch to a mile. Sheets Nos. 1, 2, 3, 4, 5, corrections to 1892.—Punjab Survey, 1 inch to a mile. Sheet No. 247, Districts Hoshiarpur and Gurdaspur. Seasons 1886 to 1888. No. 316, Districts Umballa Karnal and Saharanpur. Seasons 1870-72, 1878-80, 1887-88.—Lower Burma Survey, 1 inch to a mile. Sheet No. 569, District Nergui. Season 1890-91.—North Eastern Frontier, 1 inch to 4 miles. Sheet No. 23, S.W. (5th edition). Parts of Districts Bhama and Katha (Upper Burma). Seasons 1887-88-89-90.—North Eastern Frontier, 1 inch to 8 miles. Sheet No. 22 (3rd edition), Parts of Assam and of Singpho Hills. 1892.—South Eastern Frontier, 1 inch to 4 miles. Seasons 1885 to 1891. 1 N.E. (4th edition), Parts of Districts Upper Chindwin, Yeu, Katha, and Shwebo, of Wuntho Shan State (Upper Burma), and of Manipur Native State Assam. 1 S.E. (5th edition), Parts of Upper and Lower Chindwin, Pakokku, Ye-w, Shwebo, Mandalay, and Sagaing Districts (Upper Burma). 2 S.E. (4th edition), Parts of Districts Pakokku, Minbu, Myingyau, Melikila, Yaneethin, Magwe, and Pyinmana (Upper Burma), 3 N.E. (3rd edition), Parts of Districts Minbu, Magwe, and Pyinmana (Upper Burma), and Thayetmyo, Prome, and Tonngoo (Lower Burma). 4 S.E. (3rd edition), Parts of the Shan States (Upper Burma).—South-eastern Frontier, 1 inch to 8 miles. No. 1 (3rd edition), Parts of the Lushai and Chin Hills, of Wuntho (Shan State), and the Districts of Upper and Lower Chindwin, Katha, Shwebo, Yeu, Pakokku, Sagaing, and Mandalay (Upper Burma); of Northern Arakau (Lower Burma); of the District and Hill Tracts of Chittagong, and of Hill Tipperah (Bengal).—Upper Burma, 1 inch to 64 miles, corrections to 1891.—Gurjat States, Tributary States of Chota Nagpur, 1 inch to 16 miles. 1892.—Bombay Presidency, 1 inch to 80 miles, corrections to 1891.—Central India Agency, 1 inch to 80 miles, corrections to 1891.—District Gya, Bengal, 9½ miles to an inch. 1890.—District Jalau, N.W. Provinces and Oudh, 1 inch to 8 miles. 1891.—District Burdwan, Bengal, 1 inch to 8 miles, 1890.—District Pabna, Bengal, 1 inch to 8 miles. 1890.—District Jalpaiguri, Bengal, 1 inch to 8 miles. 1890.—Shahabad, Lower Provinces, Behar.—Bengal, 1 inch to 4 miles, corrections to December, 1891.—District Patna, Lower Provinces, Bengal, 1 inch to 4 miles, corrections to July, 1891.—Ulwar State, Rajputana, 4 miles to an inch, corrections to April, 1892.—Ganjam and Orissa, Topographical Survey, 4 miles to an inch. Portions of Raipur, Bilaspur, &c. (Triangulation Sheet). Season 1863-64.—North-east Longitudinal Series, 1 inch to 4 miles. Charts Nos. 2, 5, and 6 (Triangulation Sheets). Presented by H.M. Secretary of State for India, through India Office.

AFRICA.

Africa.

Habenicht.

Special-Karte von Afrika, im Massstab von 1:4,000,000 (or 55.5 geographical miles to an inch). Entworfen von Hermann Habenicht, bearbeitet von demselben, Bruno Domann und Dr. Richard Lüddecke. Dritte Auflage; V. Lieferung. Inhalt: Sektion West Sudan (4) nebst Bemerkungen von B. Domann. Sektion Seengebiet (8) nebst Bemerkungen von Dr. R. Lüddecke. Supplement-Lieferung. Inhalt: 1. Ethnographische Übersicht von Afrika, 2. Höhen- und Tiefen-Übersicht von Afrika. Gotha, Justus Perthes, 1892. Price 3s. each part. (Dulau.)

Part No. 5 contains Section 4, West Sudan; and Section 8, the Lake Region. In the supplementary part an ethnographical map of Africa, and a map showing the elevations of the land and depths of the ocean are given. The present edition of this valuable map is now complete.

Africa.

Herrieh.

Carl Flemmings Generalkarten No. 43, Afrika. Entworfen von A. Herrieh. Scale 14,500,000 or 198.6 geographical miles to an inch. Druck und Verlag von Carl Flemming in Glogau. Price 1s.

This is a new edition of Flemming's well-known general map of Africa, corrected and brought up to date.

Central Africa.

Stuhlmann and Emin Pasha.

Übersichtskarte der Reisen von Dr. F. Stuhlmann mit Emin Pascha, 1890-1892. Scale 1:4,000,000 or 55.5 geographical miles to an inch. Gesellschaft für Erdkunde zu Berlin. Sitzung vom 5. November 1892. Presented by the Berlin Geographical Society.

Central Africa.

Dybowski.

Itinéraire dans l'Afrique Centrale du Loango au Chari, 1891-92. Jean Dybowski. Scale 1:1,500,000 or 20.4 geographical miles to an inch. Publié par les soins de la Société de Géographie de Paris. Presented by the Paris Geographical Society.

Lake Region.

Merensky.

Karte der Berliner-Missionen—Expedition im Norden des Nyassa. Entworfen von A. Merensky, mit Zusätzen von Dr. B. Hassenstein. Scale 1:600,000, or 8.2 geographical miles to an inch. *Petermann's Geographische Mittheilungen*. Jahrgang, 1892, Tafel 19. Gotha: Justus Perthes, 1892. Presented by the Publisher.

Orange Free State.

Herfst.

Officieele Kaart van den Oranje Vrijstaat, samengesteld naar documenten berustende in het Archief van den Landmeter Generaal door J. J. Herfst, met Toestemming opgedragen aan Z. H. Ed. den Staatspresident. Bloemfontein, November, 1891. Bygewerkt volgens de besluiten van den H. Ed. Volksraad dd. 7, 9, 11, Mei 1892. Scale 1:1,500,000, or 20.4 geographical miles to an inch. Deale Brothers, booksellers and stationers, Bloemfontein, O.F.S. Price 7s. 6d. Stanford.

Though this is a poor specimen of cartography, it is nevertheless important, as so very few maps of the Orange Free State are obtainable in this country. Some statistics with reference to the population are given, all means of communication are clearly laid down; but there is no explanation with regard to the colouring.

AMERICA.

Colombia.

Hettner.

Die Kordillere von Bogotá, Von Dr. Alfred Hettner. I., Geologische Übersicht. II., Höhengichten. III., Pflanzendecke. IV., Ortschaften u. Volksdichte. Scale 1:1,600,000, or 21.9 geographical miles to an inch. — Geologische Profile durch die Kordillere von Bogotá, Entworfen und Gezeichnet von Dr. A. Hettner. *Petermann's Geographische Mittheilungen*, Ergänzungsheft No. 104. Tafel 1 & 2. Gotha, Justus Perthes, 1892. Presented by the Publisher.

Costa Rica.

Peralta.

Mapa Histórico-Geográfico de Costa Rica y del Ducado de Veragua por D. Manuel M. de Peralta, Madrid, 1892. Scale 1 : 1,000,000, or 13.6 geographical miles to an inch. Edición especial para el IV.º Centenario del Descubrimiento de América. Bruselas. Instituto Nacional de Geografía. Presented by the Legacion de la Republica de Costa Rica, Madrid.

Greenland.

Nansen.

Karte von Süd-Grönland zur übersicht der Norwegischen Expedition, 1888. (Scale 1 : 4,000,000, or 55.5 geographical miles to an inch.)—Schnitt durch Grönland um 64 Breitengrade. Dr. Nansens Route durch Grönland. Nunataken auf der Nordseite der Reiseroute. Auf Station 6 (22 August) durch die Camera clara gezeichnet.—Die Temperatur der Luft auf dem Grönlandeise. Tägliche Periode der Luft—Temperatur.—Die bekannten Profile des Inlandeises. Zusammengestellt von Dr. Andr. M. Hansen. *Petermann's Geographische Mittheilungen*. Ergänzungsheft, No. 105. Gotha : Justus Perthes, 1892. Presented by the Publisher.

OCEANS.

Atlantic Ocean.

U. S. Hydrographic Office.

Pilot Chart of the North Atlantic Ocean. November, 1892. With supplement containing charts and text descriptive of the hurricane of Nov. 21-28, off the Atlantic Coast of the United States. Published at the Hydrographic Office, Bureau of Navigation, Navy Department, Washington D.C. Richardson Clover, Lieut.-Commander U.S. Navy, Hydrographer.

GENERAL.

Astronomy.

Ball.

An Atlas of Astronomy. A Series of Seventy-two Plates. With Introduction and Index. By Sir Robert Stawell Ball, LL.D., F.R.S. London, George Philip & Son, 1892 : Price 15s. Presented by the Publishers.

This atlas contains seventy-two plates with an introduction, in which ample information is given with regard to the methods of using them. There are various novel features in the atlas which are worthy of special attention, the first of which is a series of sun-spot charts. These have been drawn on the principle employed by Mr. Arthur Thomson; and with their aid the heliographic latitude and longitude of a sun-spot may be determined within a single degree. Another feature is the "Index to Planets," which will be of great service to the beginner in the identification of these bodies. The series of moon-charts contain careful representations of the lunar formations, and give pictures of the moon for nearly every age, at which it can be satisfactorily observed, up to the time of the full. Each of these pictures is furnished with a key and index of names. This atlas also contains drawings of Jupiter, Saturn, a map of the Pleiades, a chart of Mars, plates representing nebulae, comets, star charts, and indeed all the maps and diagrams requisite to make it a complete atlas of astronomy. The letterpress is written in the author's usual clear style, and concludes with a well-chosen selection of telescopic objects.

Discovery of America.

Kretschmer.

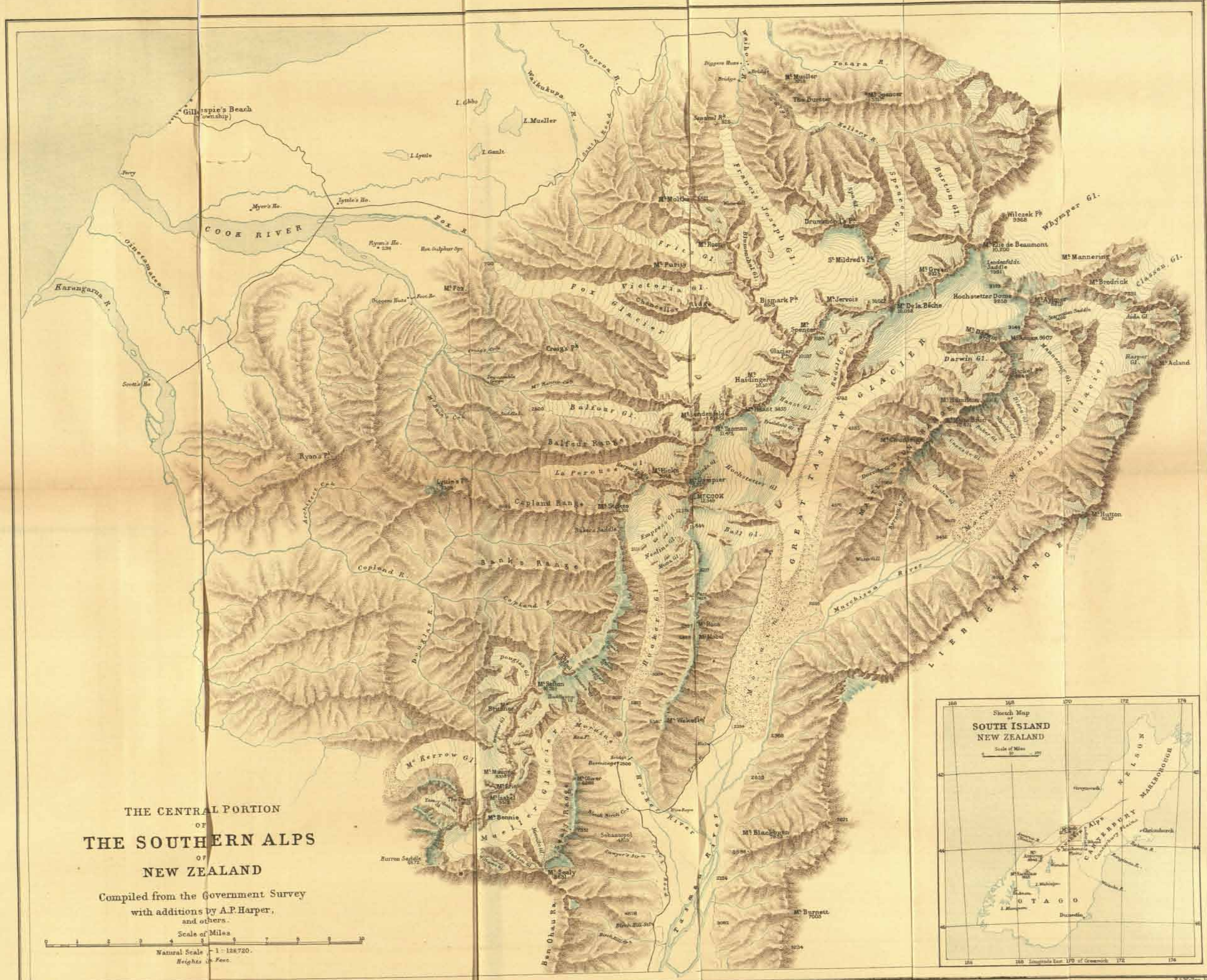
Atlas der Festschrift der Gesellschaft für Erdkunde zu Berlin zur Vierhundertjährigen Feier der Entdeckung Amerika's. Berlin, 1892. (With text). Presented by the Berlin Geographical Society.

German Colonies.

Langhans.

Deutscher Kolonial-Atlas. Dreissig Karten mit vielen Hundert Nebenkarten entworfen, bearbeitet und herausgegeben von Paul Langhans. Erste Lieferung. Inhalt: Vorwort und Inhaltsübersicht. No. 1, Verbreitung der Deutschen über die Erde. No. 25, Schutzgebiet der Neu Guinea-Kompanie, Blatt 2. Gotha, Justus Perthes, 1893. Price 2s. each part. (Dulau.)

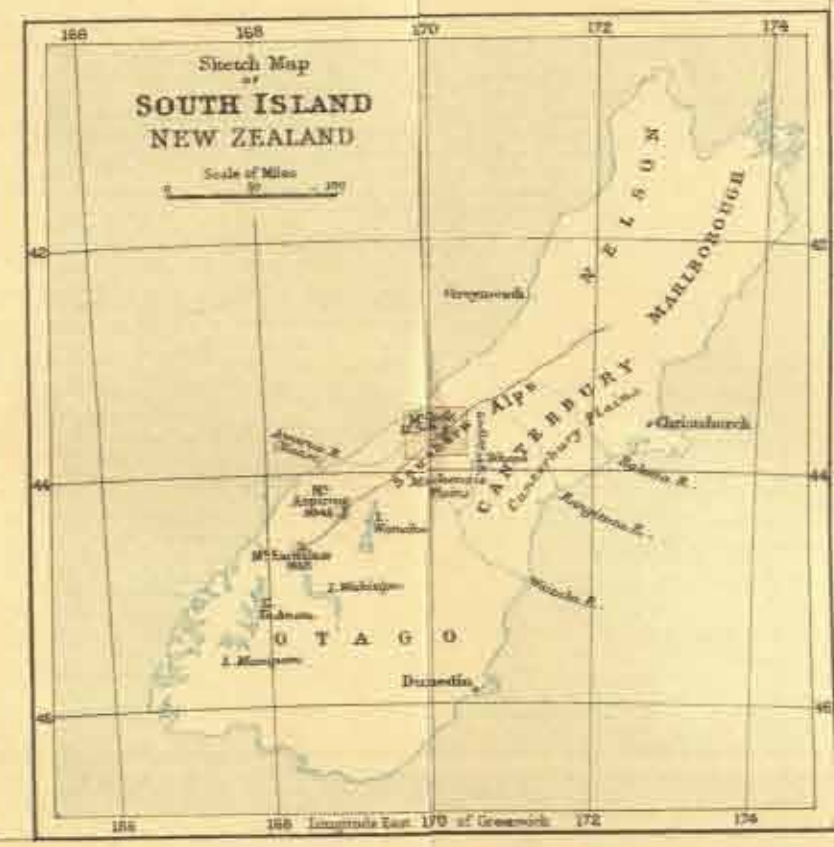
This is the first issue of what promises to be a very good atlas of the German Colonies. It will be completed in fifteen parts, which will be issued at intervals of from



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OF
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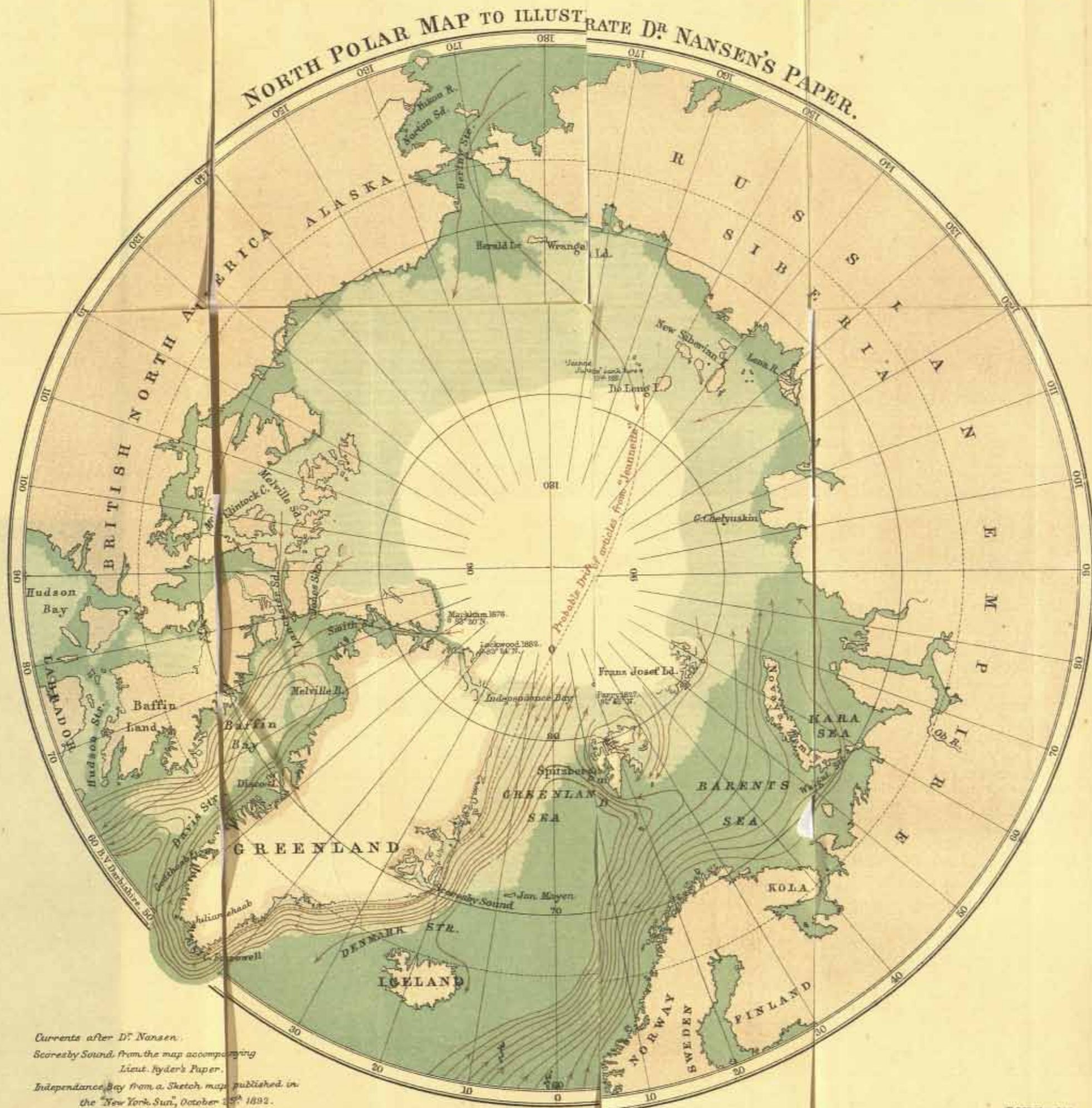
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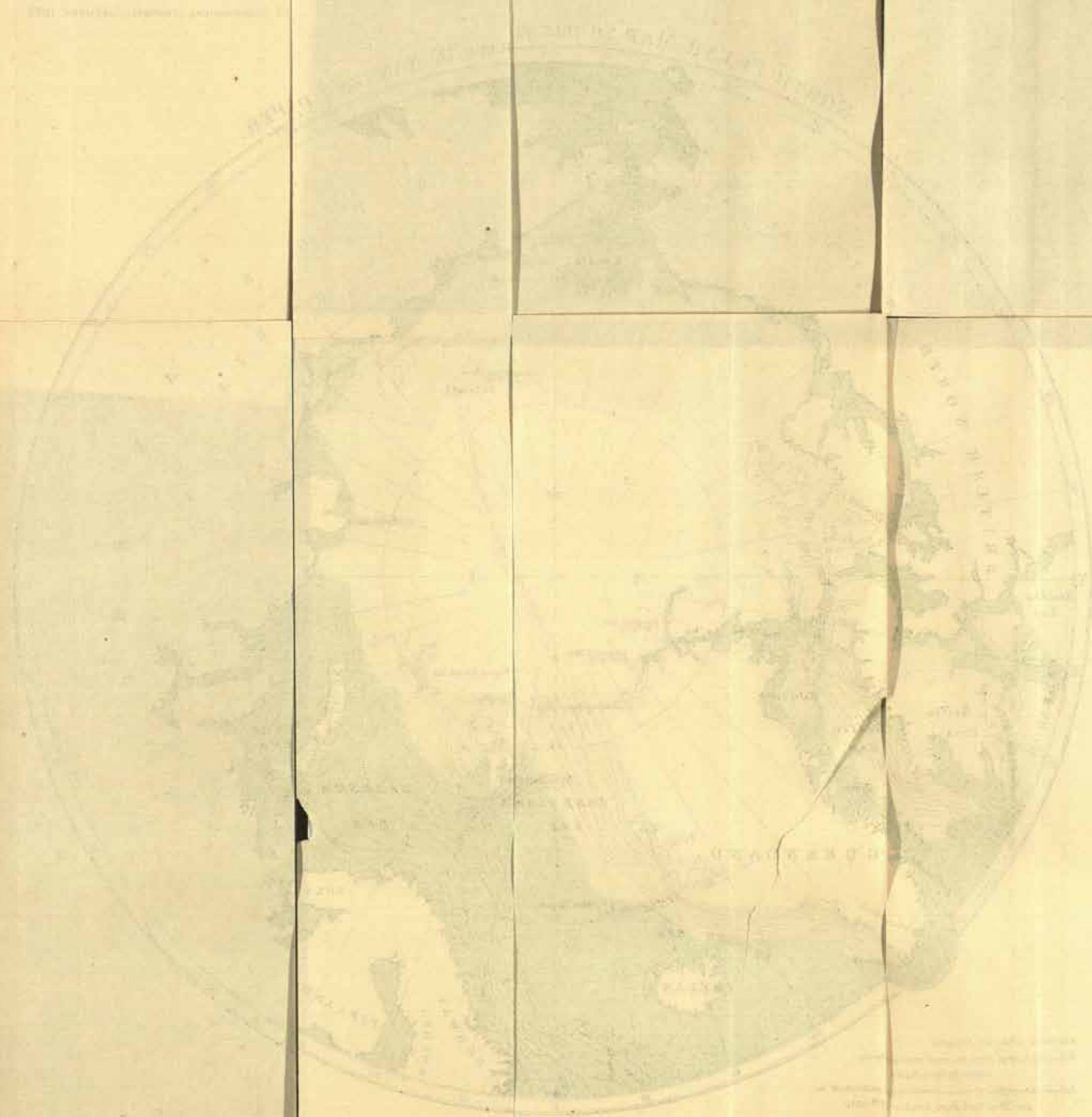
Scale of Miles
Natural Scale 1:128,720.
Heights in Feet.



THE SOUTH ALPS
NEW ZEALAND

THE SOUTH ALPS
NEW ZEALAND
THE CENTRAL MOUNTAINS





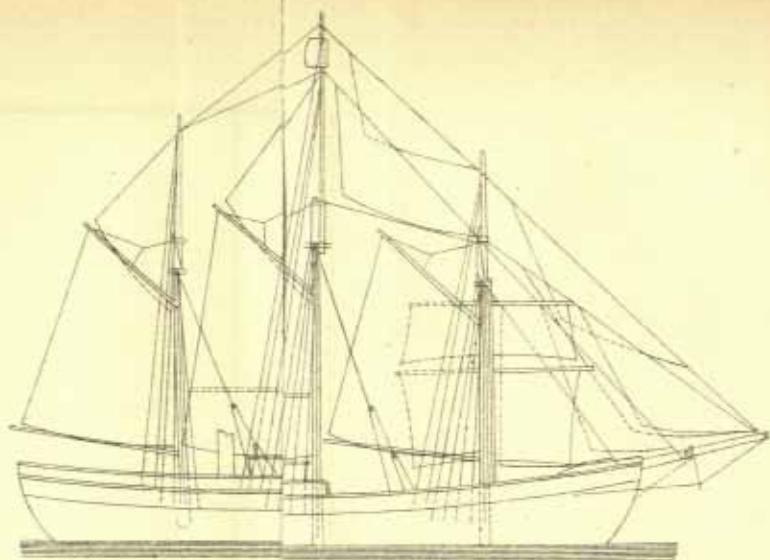


Fig. 1

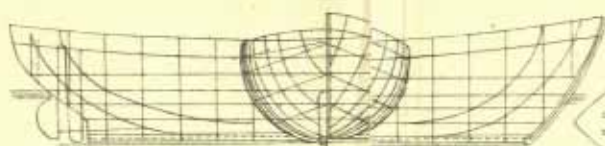


Fig 2

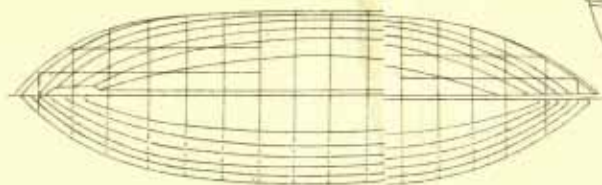


Fig. 3

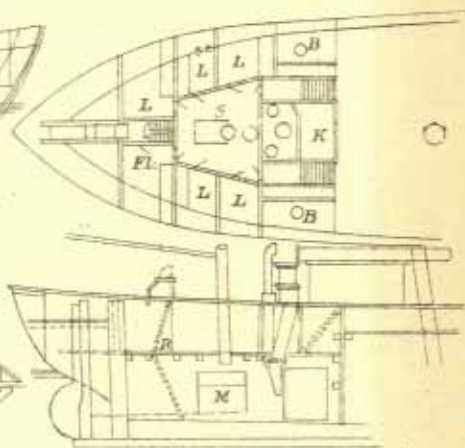


Fig 4

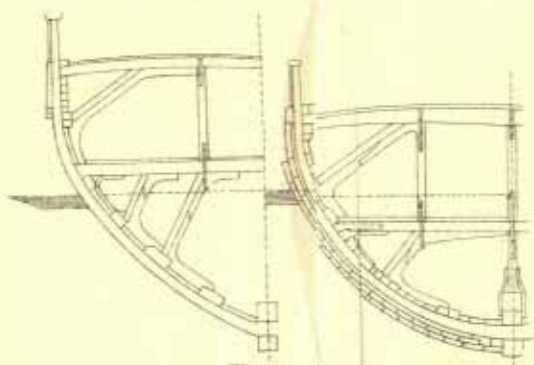


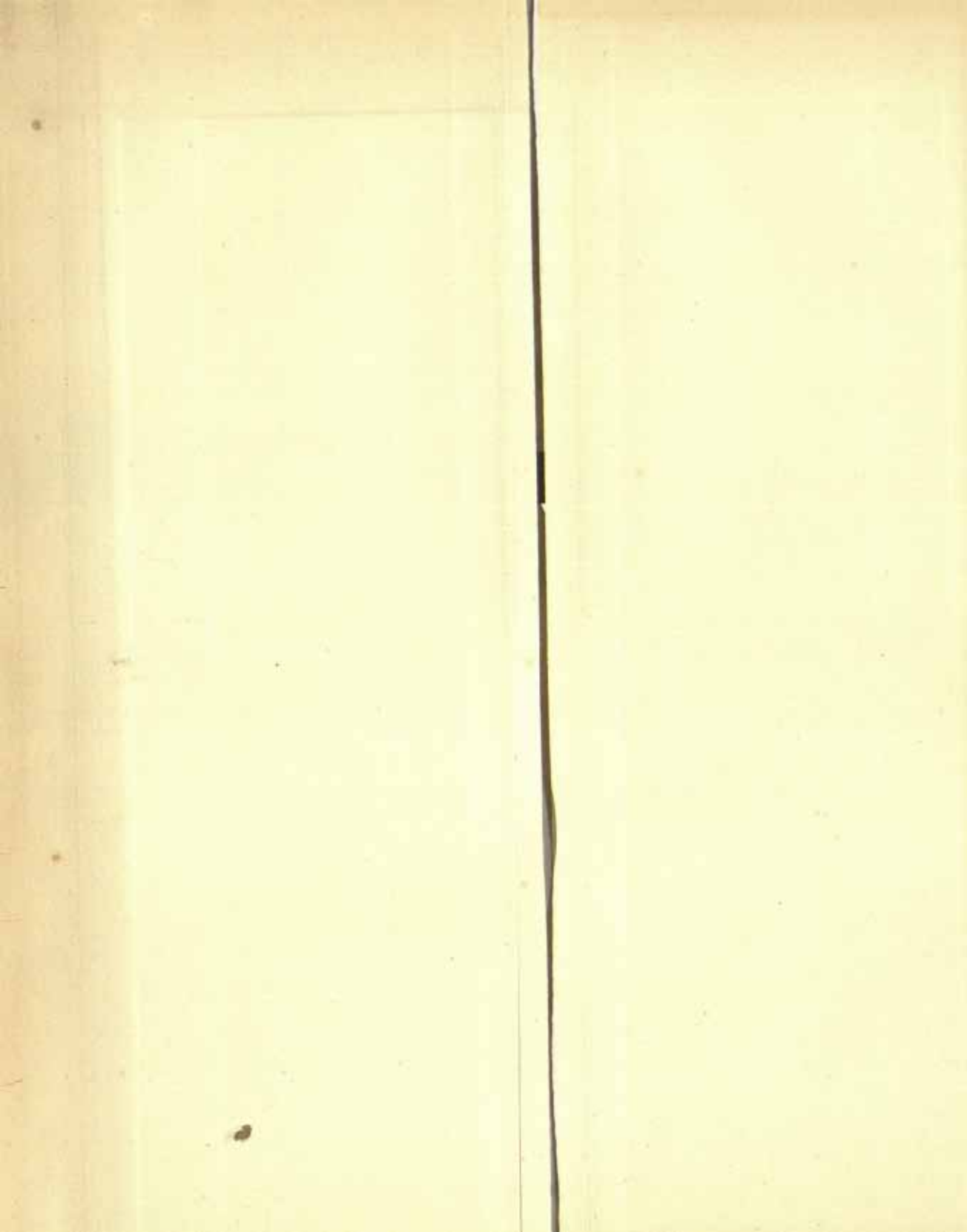
Fig. 5.



Fig. 6

DIAGRAMS OF DR. NANSEN'S VESSEL, THE "FRAM."

Published by the Royal Geographical Society.



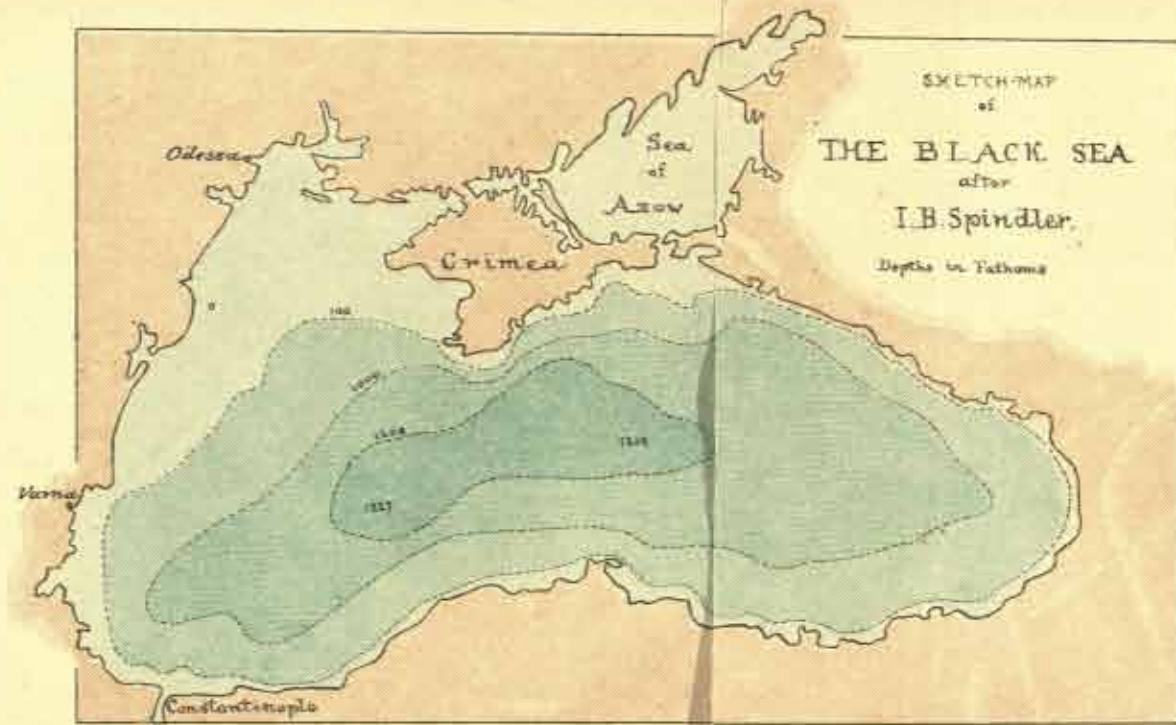


Fig. 3.

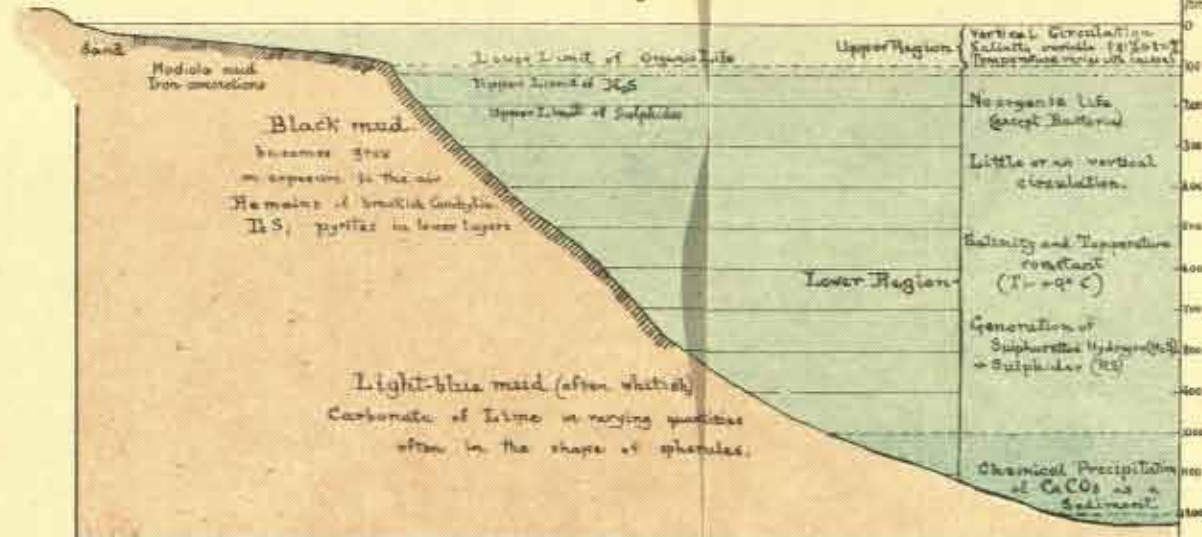
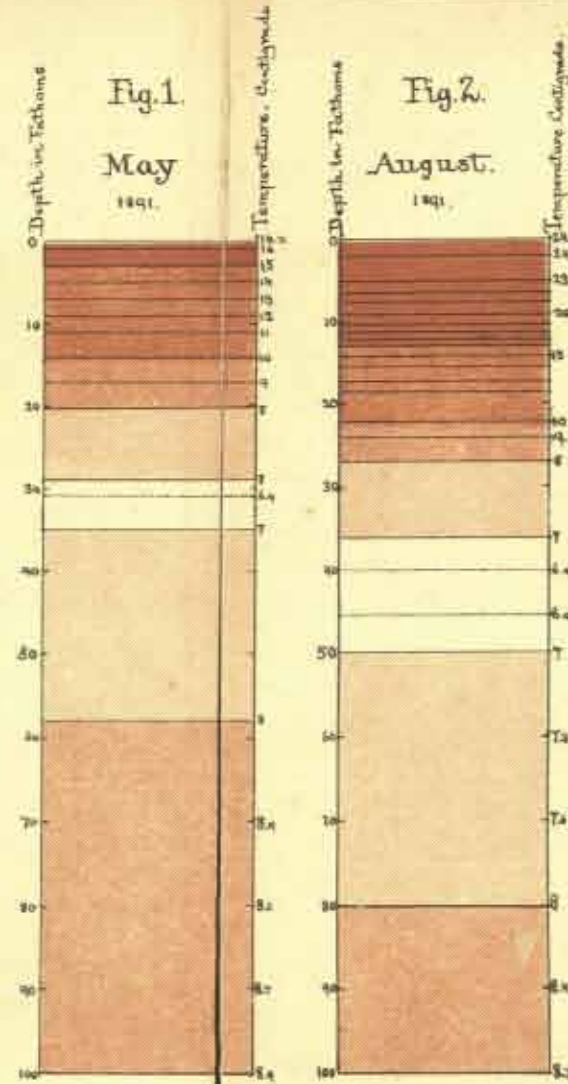


Diagram of the physical and biological conditions of the Black Sea.

B. K. Carlschire.



Distribution of Temperature
in the Surface-layers
of the
Black Sea.

From observations taken in the summer of 1891.

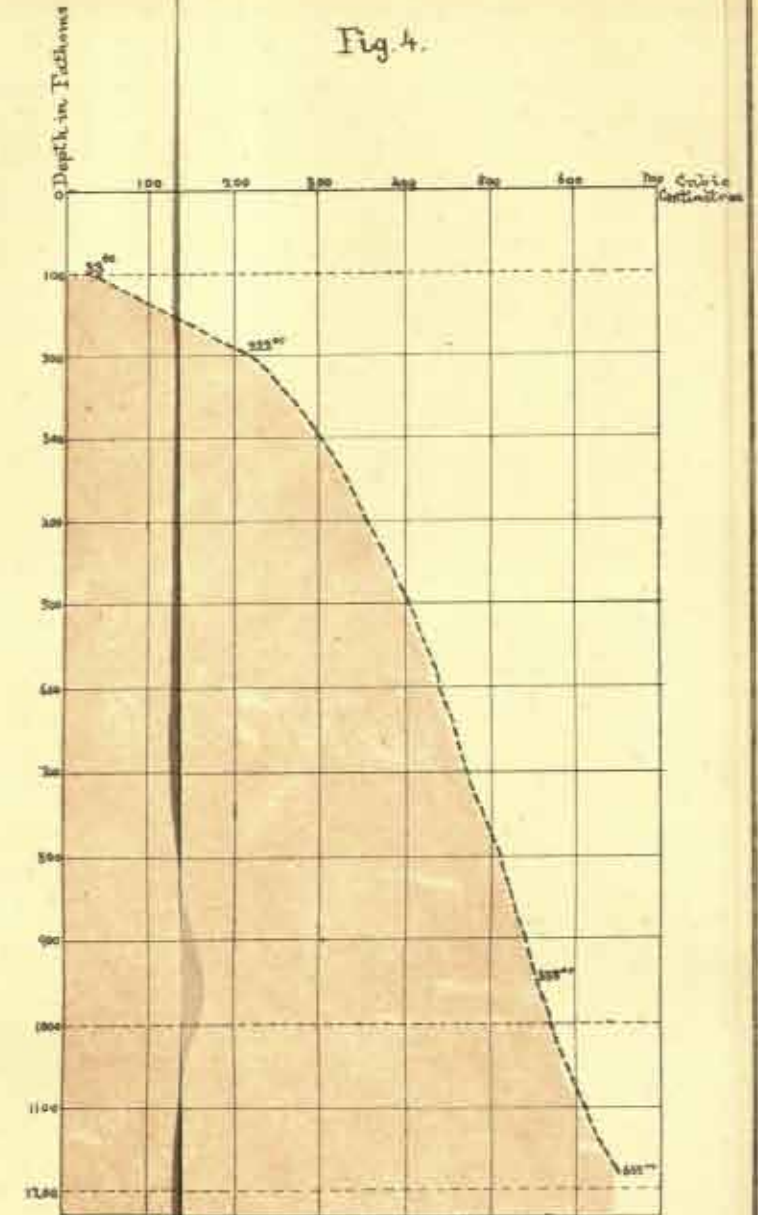


Diagram showing number of cubic centimetres of H_2S
contained in 100 litres of water.
at varying depths.
(after Lebedintseff).

four to six weeks, each to contain two maps. The present issue contains a preface an index to the whole work, and maps Nos. 1 and 25. The former gives the distribution of Germans throughout the world, and the latter forms part of a six-sheet map, the possessions of the German New Guinea Company. The maps are very well drawn, and numerous insets are given.

The World.

Baur.

Neueste Karte der Erde. Mit Rücksicht auf das Bedürfniss des Handelsstandes sowie für den Unterricht an Lehr-Anstalten, entworfen und gezeichnet von C. F. Baur. Verlag von Julius Maier. Separat-Konto, Fr. Doerr in Stuttgart. Price 6s. Williams and Norgate.

The World.

Cassell.

The Universal Atlas. Complete in 28 parts, including Index. Published by Cassell & Co., Limited, London, for the Atlas Publishing Company, Limited. Part 21. Price 1s. each part. Presented by the Publishers.

This part contains maps of South India, Burma and Malay Peninsula, a general map of Africa, and the first part of the index.

Historical Geography.

Vidal-Lablache.

Histoire et Géographie. 137 Cartes, 248 Cartons. Atlas Vidal-Lablache, Maître de Conférences de Géographie à l'École Normale Supérieure. Paris: Armand Colin et Cie., Editeurs. 17^e Livraison. Price 1s. 2d. Dulau.

Three historical and three geographical maps are contained in this number, and, as usual with this atlas, numerous insets and copious foot-notes are given.

PHOTOGRAPHS.

West Africa.

Lang.

Twenty-three Photographs of Scenery and Natives of West Africa, in the neighbourhood of Kumassi, Bontuku, &c., taken by Capt. J. I. Lang, R.E. Presented by Capt. J. I. Lang, R.E.

This is a very interesting series of photographs taken by Capt. J. I. Lang, R.E., while travelling and serving on the Anglo-French Boundary Commission in West Africa.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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VOL. I.

TO LAKE BANGWEOLO AND THE UNEXPLORED REGION OF BRITISH CENTRAL AFRICA.*

By JOSEPH THOMSON.

IN the beginning of 1890 the British South Africa Company, in pursuance of the splendid enterprise which has marked its short but brilliant history, offered me an opportunity of visiting Lake Bangweolo and the neighbouring regions. It hardly needed a glance at the map of Africa to determine my eager acceptance. Here was the blank space dear to the heart of the explorer, whereon, with a free hand, he might sketch mountain and lake and river, and then long to go and find them realities. Here also was the sacred spot where Livingstone closed his great career, leaving his heart in the land where all his thoughts and aspirations were centred. To fill up that gap in the map, to visit that classic ground, were privileges not to be lightly valued.

In pursuance of my mission, I left England on April 18th, 1890. A visit to the Cape and Kimberley, to receive my final orders from Mr. Rhodes, formed an agreeable interlude in my voyage to East Africa. At Kimberley I had the good fortune to meet Mr. James A. Grant, son of the late Colonel Grant, a name especially dear to the memory of this Society. Mr. Grant promptly accepted the opportunity I offered him of following in the footsteps of his father, and, need I say more, than that he showed himself in everything worthy of his name.

On June 1st we left the Cape, and on the 15th arrived at Kilimane. This town agreeably surprised us, its well-laid-out streets, and quaint houses embowered in groves of palm and mango, banana and orange, forming a charming oasis in a repulsive wilderness of mangrove swamp. We arrived in an evil hour, the Anglo-Portuguese difficulty having then reached a crisis. The anti-English feeling ran high, and expressed itself on the part of the officials in a thousand ludicrously childish,

* Read at the Meeting of the Royal Geographical Society, November 28th, 1892. Map, p. 192.

though none the less annoying, ways. Nevertheless, after a lot of hard work and much trouble, in ten days we were ready to leave with all our belongings safe and sound, and with fifty-five stalwart Makua porters from Mozambique, whose services we secured, thanks to the energetic and generous offices of Mr. Churchill, the then Acting-Consul. At sunset of June 26th we went on board our boat *en route* for Vicenti and the Zambesi by way of the Kwa-Kwa creek and stream.

If time permitted, and new lands did not call for our special attention, it might have been of some interest to describe our observations on the way to the Zambesi. Before our eyes lay a beautiful geographical object-lesson, telling how the land encroaches on the sea and how deltas are formed. Here, seaward, was the mangrove advance-guard, ceaselessly throwing its nets of living rootlets over the floating sediment, and making it land. Behind, over many a sad mile, spread the genuine swamp—half land, half sea—where yet the mangrove held protective sway, and kept firm hold of the reeking repulsive mud. As mile followed mile the land became more firm and solid; the mangrove, its duties over, began to dwindle; more and more wholesome conditions prevailed, and with them brighter forms of vegetation and more cheerful life, until at last Nature displayed herself in all her lavish tropical maturity.

In three days we passed through these various stages, and reached, at the village of Mogarumbo, the limit of the tide. Beyond, the Kwa-kwa was simply a small winding stream little broader than our boat. But here the chief beauties of the land were found—some of the loveliest spots, indeed, I have anywhere seen in Africa. A series of charming little ponds connected by the narrow winding stream, and circled with groves of giant borassus palms, lay like a jewelled necklet on the broad bosom of Mother Earth. Lilies in full flower spread themselves on the glistening waters, over which the water-birds tripped lightly, while on overhanging bush and tree brilliantly-coloured king-fishers and snow-white egrets kept watchful eyes for unwary fish. The picture is complete if you but add a canoe gliding silently across the water propelled by a naked native, who stands upright in magnificent pose at the stern, and seems a part of his frail craft, so confident is his attitude, so gracefully does he move in harmony with it. Through not one but many of these fairy lakelets we paddled our way, till on the sixth day after leaving Kilimane we reached Vicenti, and the yellow sands, the reed-covered islands, and the glistening waters of the Zambesi lay before us. Much to our delight, we found the *James Stevenson*, the African Lakes Company's steamer, ready to start up the river, and on July 3rd, after the customary trouble with Portuguese officials, we started on our voyage.

On the fourth day we reached the mouth of the Ruo—the boundary-line between English and Portuguese territories. To our unbounded

surprise we were allowed to pass the frontier without being challenged till after we had tied up to the bank. Then it proved that the officials had been caught napping, and to show that they were once more wide awake, they commenced firing big guns to frighten us.

The events of the next few days were full of absorbing interest to us all, but are somewhat outside the scope of a geographical paper. The *James Stevenson*, in attempting to redescend the river, was captured, and her officers sent prisoners to Kilimane. The day following I was myself the victim of a most unwarrantable outrage. While descending the Ruu in a boat, keeping close to the British side, and, therefore, within my rights, I was ordered by the Portuguese to stop. As I took no notice of the challenge, several shots were fired. This having no better effect, the alarm was sounded, and the ludicrous spectacle was presented of an army of over 2000 native soldiers turning out to stop the progress of a single white man and his three servants. Under their commander, Lieutenant Coutinho, the troops lined the banks and fired volley upon volley of blank cartridge at us, while boats started in pursuit. Finding sound and fury of no effect, ball cartridge was resorted to, and my life was placed in the most imminent danger, as well as the lives of a dozen or so of my countrymen on our bank of the river. Still I kept steadily onward, though for a time it looked as if I should scarcely escape being captured. Another minute, however, and I had reached the Shire, and was creeping up under its protecting banks. To add to the laughable display, at the very moment I disappeared round the corner the Portuguese heavy guns began to boom out their angry summons; but it came to our ears transformed into a *feu de joie* over our victory.

All demands for an explanation from Lieutenant Coutinho only elicited from him the statement that he was acting according to orders, and with that I had to be content.

From Chiloma, on the Ruu, Blantyre is usually reached by way of the Shire to the foot of the mountains, and then overland for over 30 miles. For us that route was not convenient. The river was too low for the *James Stevenson*, and there were not sufficient boats for our large party. We determined, therefore, to strike out a new path for ourselves, and cut straight over the mountains, which here form a frowning rampart only a few miles distant.

We left Chiloma on July 12th, and a short march over a rich alluvial plain, made park-like by fine clumps of trees with grassy glades between, and yet tropical with its display of palm and baobab, brought us to the village of Mona. Next day we attacked the mountain barrier, or rather plateau escarpment, and after a hard climb amid pouring rain, reached the top at an altitude of about 4000 feet. Here we found ourselves on the watershed dividing the tributaries of the Ruu from those of the Shire. These uplands proved to be rich and beautiful far beyond our expectations, while the prospect was magnifi-

cent. Away to the south we could command an extensive view over the great plains of the Shire and Zambesi, with their fine isolated mountains. Eastward the great Milanji towered majestically over the plateau. To right and left mountain torrents had carved the land into a hundred picturesque shapes of hill and glen. Dense clumps of bamboo and isolated flat-topped acacias, hoary with clinging lichen, crowned the various eminences, or spread themselves over the slopes. Deep down in sheltering dales, tree fern, wild date palm, and dracana combined their graceful forms with arborescent giants and festooning creepers to form the gallery forests that so often shade and beautify the streams of Africa. Here, if anywhere, we should have expected to find the native village and the well-tilled garden; but we looked in vain over many a fertile mile. An eloquent silence brooded over the land, and told the usual sad tale of native wars and slave raids. Our thoughts were carried back to the time when Bishop Mackenzie retreated across these very hills, ill and heartbroken, to die at the Ruu, while the simple people for whom he came were butchered, enslaved, or left to starve by the ruthless Wayao. No others of the race reoccupied the ravaged lands, and nature soon, with kindly hand, hid all trace of "man's inhumanity to man," and made as though neither woodman nor tiller of the soil had e'er been there.

Over this delightful country, and still keeping along the watershed, we travelled for four days. Then again we found man the master of the soil. Peace and security beamed on every face, while beads and cloth told of wealth and ease. Friendliness was in the air, and on all hands we were greeted with familiar yet strange "Good-mornings." Here was pleasing evidence indeed that we were nearing our destination for the time being. A few more miles, through well-tilled fields and by populous villages, and we had rounded the granite dome of Soche, and Blantyre was before us. Instinctively we stopped to mark the view, and gladly noted that there was nothing sordid or commonplace in it. The rugged hills of Soche, Nyambadwe, and Dorande, gave the landscape an air of dignity, and with picturesque, protective air overlooked the undulating low grounds that spread between. A little further on and we were able to observe with a new pleasure the green mosaics of the planter, and by-and-by house and store, church and school, appeared on points of vantage. Finally we struck a road—a real genuine road, with wheel-tracks—and following it, found ourselves transported with magical swiftness from a silent African wilderness into the cosy comfort of a Scottish home, where the Glasgow accent reigned in delightful supremacy.

Our surprise and wonderment did not end with our arrival. It required longer and riper acquaintance to adequately comprehend the great work that has been accomplished here by a handful of missionaries and traders, of whom Scotland may well be proud. Unaided

by Maxim guns or Government support, and armed only with moral weapons, they wielded a powerful influence, which embraced a hundred chiefs, and extended over all Nyasaland as far as the distant shores of Tanganyika. Of this influence for good what more eloquent than the fact that thousands of Angoni warriors now come annually from their distant hills to cultivate the fields they were wont only a few years ago to ravage with fire and drench with blood, and, in the most literal sense, turning their war axes into pruning hooks. That is but one of many equally striking transformations which have been effected within a few short years, and I can honestly say that for the first time in all my wide African travels I here found a spot where the advent of the white man might be described as an unmitigated blessing to the natives.

Among the early pioneers of the region there are four who hold an unique place as the founders of British Central Africa, and but for their efforts it would not now be so named or coloured red on our maps. These are, first, the Messrs. Moir, two men who are the very beau-ideal of commercial and philanthropic heroes, men who have suffered and slaved with an unselfish enthusiastic devotion to a noble ideal in a manner beyond all praise.

After these comes the Rev. D. C. Scott, the head of the Blantyre Mission. About him I can only speak in superlatives, at the risk of appearing to exaggerate. The least advertised of missionaries, he yet stands head and shoulders above every other man I know of in the African mission field, whether you consider his personal magnetism, his breadth of view, his depth of culture, or simply the work he has achieved. The church he has planned and built is in its way the most wonderful sight I have seen in Africa. Others will see in his Manyanja dictionary an even greater monument to his genius. His method of teaching goes far to solve the difficult problem how best to influence the negro for good, and is bearing the rich fruit it deserves. Among the varied activities of this capitally-managed mission, not the least interesting is the English and native newspaper issued monthly from its press.

But of subjects for praise there is no end, and I therefore pass on to mention Mr. John Buchanan as the person above all others who has practically shown in what direction Nyasaland must look for its future development. Thanks to him and these three others, the foundations of our empire in South Central Africa have been firmly established, and Mr. Johnston, Her Majesty's Commissioner, is to be congratulated on having the ground so thoroughly prepared for him to enter in and take possession.

But I must leave this fascinating topic, and hurry on to fields and pastures new to geographical science. A few days at Blantyre sufficed to complete our preparations for more extensive travel. On July 21st

we left for Matope, on the Upper Shire, where the lake steamer, the *Domira*, awaited us. Two days later we were steaming against the broad breast of the current, thoroughly enjoying the delightful panorama of tropical scenery that we passed, but need not stop to describe.

On the second day from Matope we entered Lake Nyasa. As I looked across its wide waters and scanned its enclosing mountains I could not but recall that day twelve years ago, when, as leader of the Royal Geographical Society's expedition, I stood at the north end at an altitude of 8000 feet, and surveyed for the first time the magnificent mountains and the wide shimmering sheet of water at their base. But how different the conditions. Then, footsore and weary, broken down with fever and hardship, I reached the north end; now I entered the south in a well-appointed steamer, with not a worry, not a hardship, not a fever to recall, and with men, goods, and health intact for whatever might be before me.

On the 27th we reached Kotakota, an important town on the west side; and here we landed, while the *Domira* went north to bring in Atonga porters from Bandawe, and guns from the north end of the lake. Our reception by Jumbé, the Swahili ruler of Kotakota, was most hospitable, and we passed our time very agreeably making up the loads, and otherwise getting ready for the march.

As a result of barometric observations taken here, we made out the altitude of the lake to be 1430 feet, a result somewhat less than that obtained by some other observers.

Owing to a mishap to the *Domira*, our proposed short stay at Kotakota was extended into a month, much to our disgust, as the dry season was already far spent, and the rains were at hand. It was accordingly August 23rd before we were ready to start.

The expedition, besides Mr. Grant, now included Mr. Charles Wilson, a young fellow who proved to be the best of assistants. Of natives, we had fifty-five Makua and ninety-eight Atonga; but of these only twenty were armed. Our proposed route lay straight west to the Luapula and the south end of Bangweolo, and thence south over the Loangwa-Kafue plateau wherever circumstances permitted or interest led us. At the very moment when all our arrangements were completed, and everything was in marching order Grant was attacked by fever. But with true explorer's spirit he would hear of no delay on his account, and vowed he would have it out with the microbes on the road. We started accordingly, our way for the first two days lying over the cultivated rolling country that here borders the lake. On the third we commenced the ascent of the abrupt escarpment of the plateau, making a somewhat trying march along an inclined buttress, conveniently carved out by mountain streams for the benefit of the traveller. Another day, and the top was reached at an altitude of nearly 4500 feet, and backward we took our last look, over the wooded glen-scarred

face of the escarpment, across the low grounds and the shimmering lake to the distant mountains beyond.

A mile or two further, and unobstructed, the wide expanse of the plateau itself lay spread before us. It was tantalising to find it wrapped in a dim haze when our eager eyes longed to compass so many miles. But if the grey sheen restricted our view, it had its compensations in the softness and glamour which it lent the landscape. A thousand feet above us towered the bold rocky peak of Chipata, which, with lesser hills to north and south, formed a broken yet massive rampart along the plateau edge. A lightly-wooded country stretched away westward, in what would have been a somewhat monotonous sequence of slightly broken reaches, but that through the dim mist a number of sharp isolated peaks broke abruptly from the general level, and caught the eye with their picturesque commanding forms. Conspicuous among these were the massive dome of Bango, the more rugged eminence of Ngara, and, most distant of all, the sharp pyramidal rock of Kasungu. Where we stood we were still in the depopulated country of Marimba, ruled over by Jumbe of Kotakota. Far away to the south-west lay the densely-populated territory of Mpeseni, the Zulu chief, who had conquered and taken possession of the land. To the west-north-west, marked out by its central feature, Kasungu, lay the district of Mwasi. We elected to pass between, along a narrow zone of country which forms a buffer between the two chiefs named, to the perpetual discomfort of its wretched inhabitants.

Our first impression of the country was only intensified by a closer acquaintance. From the edge of the plateau, at an altitude of 4000 feet, the ground sank gently down to 3000 feet some 30 miles from the River Loangwa. Throughout its whole length we crossed no perennial stream save the Bua. No vale, or glen, or gorge gave diversity to the scene. The vegetation was as poor as the surface features were commonplace. Open forests of small gnarled trees did their best to cover the nakedness of the land. They gave it greenness, but little more.

The inhabitants reflected the character of their country. They were few, and their villages far between; and it was clear that their lines had not fallen in pleasant places. Thanks to their unhappy position between Mpeseni and Mwasi, they see in every stranger an enemy, a fact which gave some much-needed colour to our march. Time after time we were assumed to be the inimical strangers bent on death and destruction. Then with startling suddenness the hitherto silent wilderness quivers over many a near and distant mile with the warning cry which calls the men to arms, and sends the women and children to the woods for shelter. Here, there, everywhere, the excited warriors rush to the appointed meeting-places, and, gathering confidence with numbers, approach with threatening cries, spears poised in the

air, or bows stretched to their utmost. In an ever-increasing throng they gather round, working themselves into a frenzy with their fears and hatreds, their savage war-cries and wild antics. This is the moment of danger—the moment which determines whether it is to be peace or war. An accidental shot, an arrow slipped from the drawn bow, and nothing can stop bloodshed. On the other hand, a little coolness, a little confident patience, a little more time for the effervescence of the mad passions aroused, and peace ensues with equal certainty. The threatening cries gradually change to friendly shouts, and the warriors who came to fight remain to dance.

My experience of African war alarms has invariably been the same, and I cannot but believe that many of the fights which have marked the progress of more than one expedition might have been avoided by the recognition of the true character of the demonstration, and the exercise of a little tact and patience on the part of the explorer.

The unhappy villagers who thus received us on our march belong to a branch of the Wa-Nyasa, and do not call for any special description; indeed, to describe them adequately would require a realistic touch more suited to the robust appetites of the ladies and gentlemen of the Anthropological Society than to that of those who gather here.

Before leaving their country, however, let me say that it by no means represents the general character of the plateau. Quite the reverse, in fact. Both north and south a beautiful region, picturesque with hill and dale, and bright throughout the year with flowing streams, affords support to a dense population; but this we did not see till our return, and, consequently, for the time being were very unfavourably impressed.

On September 8th, after a three days' march from Kwa Kenundu, the last Wa-Nyasa village, and a descent of 1000 feet, we reached Kiwende, the country of the Babisa chief Kabwire, in the rich alluvial plains of the River Loangwa. Here our reception was most friendly, and it was pleasant to note the air of comfort and security which characterised the large population. The congenial conditions conducing to this happy state of affairs had been obtained in what will appear to many a strange fashion, Kabwire having been compelled to place himself under the protection of what is popularly supposed to be the native's natural enemy, the Arab trader, in order to defend himself against the bloody slave raids of one who was half a Portuguese. It seems scarcely credible, but it is none the less a thoroughly established fact, that this half-caste scoundrel, Matakanya, has depopulated an enormous tract of country in the Loangwa valley, making Zumbo his headquarters.

At Kabwire's we were confronted with one of those dangers which so often worry the African traveller. Our Atonga, unaccustomed to long expeditions, took fright on finding that they were to proceed beyond the Loangwa, and prepared to desert in a body. Fortunately, we had

timely notice, and by prompt measures put an effectual stop to their plans.

After two days' rest we continued our journey westward. A short march brought us to the banks of the Loangwa, which we here found to be about 100 yards broad, flowing in deep quiet reaches, or in swifter shallows, 4 to 6 feet deep. Of course in the wet season it would show a very different aspect. Its altitude at our camp we ascertained to be 1700 feet. On September 13th we forded the river some 10 miles south of the place where Livingstone crossed on his last great journey, and for two days we travelled over dark alluvial plains, in part well-wooded, in part park-like, and enlivened here and there by herds of antelope and zebra. In this section there were no streams, and the heat was intense. During the succeeding two days pleasanter conditions prevailed. The monotonous plain broke into charming undulations, threaded by many a winding stream and rivulet, and pleasingly wooded on height and hollow.

As far as the Loangwa, the rocks forming the plateau had proved to be metamorphic, with intruding masses of granite. In the valley these were overlaid by sedimentary strata, chiefly red sandstones, shales, and marls. At one place we came upon a remarkable collection of great fossil trees, many of which were 3 feet in diameter, and 40 to 50 feet in length.

On the fourth march from the river we reached Kwakataru, the first village after leaving Kabwire. It nestled comfortably in a pleasant hollow by the side of the River Mpamanzi, and at the base of the so-called Muchinga Mountains, which here overlook the valley with a seemingly unbroken front rising from 2200 to 4500 feet.

To regain the plateau, of which these seeming mountains are in reality the edge, we now took our way upwards along the romantic and picturesque glen of the Mpamanzi. Leaving behind us the sweltering monotonous plains, we speedily feel the bracing effect of the mountain breeze sweeping down the glen. Above us we look up 2000 feet and see grey crag and rugged precipice break in many a wild and threatening shape from the green forests which struggle for a foothold on the nether slopes. Below flows the river, here sweeping past a dense brake of waving bamboo, there lingering to lave the roots of palm and tree-fern bending streamwards, enamoured of their own mirrored loveliness. Anon it seems to sleep in some rock-bound basin, and over it the lilies spread their green leaves and budding flowers, till, waking suddenly again, it sweeps onward under an archway of leafy trees, or dashes itself to foam among obstructing rocks. At any moment the dreaded buffalo may break in fierce rush from that dense brake; there the monkey swings from tree to tree; above the baboons clamour noisily, safe on their distant perch; while the green parrot flits screaming past, striking a discordant note in the softer music of the wind and stream.

Under such attractive conditions we would gladly linger, not two but many days, but that our duty calls us to the wider platform of the heights above, which we eventually attain at an altitude of over 4300 feet.

From our coign of vantage our first glance was for the Lokinga Mountains, which make such a conspicuous figure on our maps. We looked in vain. Neither then nor afterwards did we either see or hear of them. Instead, a scene of unexpected beauty riveted our gaze. Before us spread, far as the eye could reach through a clear atmosphere, a billowy country like the swelling sea, its every feature clad with an unbroken forest, its winding hollows traversed by numerous streams. On this pleasing landscape lay the rich colours of a dawning spring, gorgeous yet delicate, surpassing anything to be seen in the autumn glories of our own woodlands or of the flowery splendours of a Moorish summer. Ruby and crimson—the distinctive tints of the young mimosa leaves—prevailed, and massed together, glowed under the tropic sun like a field of living flame. Interwoven with these, and tempering their brilliancy to a delicious harmony, were the yellows and browns and greens of every subtle tint and tone that marked the foliage of the passing year; Growth and Decay, Life and Death,

“Alike in glorious livery dight,
And fair to see.”

The forest which decked itself so gorgeously is composed of anything but fine trees. On the contrary, as I can affirm from personal observation, here, as over the whole of East Central Africa, from the Zambesi to the Equator, and from the Great Lakes to the Indian Ocean, the same stunted and gnarled forms prevail. In making this wide statement I am aware that a somewhat similar one, made by Professor Drummond, received a smart criticism from Stanley in the pages of his ‘Darkest Africa.’ But Stanley’s description of an Aruwimi forest was in no way a refutation of Drummond’s, which clearly only referred to East Central Africa. The mistake the latter made was in not giving his authorities, and speaking of thousands of miles when he was only acquainted with tens.

The day which introduced us to the beauties of what, for convenience, I call the Loangwa-Kafue plateau, did not end without a jarring note when least expected. Owing to a ridiculous mistake, the Makua porters had their Mohamedan prejudices wounded over the killing of a goat, and flew into a frenzy of excitement which culminated in every man of them marching out of camp, homeward bound as they declared. Though annoyed, we were not alarmed. We took our measures, and next day, though not one of the deserters had come back, Wilson was sent forward with the Atonga, while Grant and I sat down to await the return of the mutineers. Nor were we disappointed in our calculations.

Within a couple of hours they all dropped into camp, crestfallen and shame-faced, and, picking up their loads, hastened off to rejoin the rest of the caravan.

For two days we continued our march westward, over country such as has just been described. A cool breeze tempered the fierce sun, streams were everywhere, and the soil was excellent, though, strangely enough, inhabitants were a-wanting. On the third march we reached the watershed of the plateau, at a height of about 5300 feet. Here we found what we may describe as the attenuated remains of the Lokinga Range, in the form of a series of isolated massive granite domes and peaks, bare of soil or vegetation, rising 500 to 600 feet above the level of the plateau, or to an altitude of close upon 6000 feet. They have received the name of the Vimbe Hills, and trend north and south, marking the watershed of the streams flowing east to the Mpamanzi and other tributaries of the Loangwa, and those running west to the Molembu, Lulimalu, and other affluents of the Luapula.

A few miles west of the Vimbe Hills we passed a curious peak of much-shattered and tilted sandstone, a remnant or outlier of some great series of sedimentary rocks which must at one time have overlain the whole country, and which we found still intact 30 miles further west. Continuing our way, we reached, in a slight depression of the plateau, a lake, some 30 miles in area, and after wading waist-deep for an hour through swamp, we camped in a deserted village on an island. This lake drains into a stream called the Lusiwazi, and having no other name, we gave it that of Moir's Lake, in compliment to the two brothers who have done so much in and for Nyasaland.

Next day, September 21st, we left the island and camped at Kwa-Nansara, or village of Nansara, a female Babisa chief. Here we made a discovery of the most alarming character. Small-pox had broken out in our caravan, and eleven men were already plainly marked with the loathsome disease. There was absolutely but one course for us to take under the circumstances—we must leave the sick behind; and this we accordingly did, after making all possible provision for their safety and comfort.

From Nansara's we still journeyed westward, crossing the head-waters of the Molembu River. Near the village of Serenje we left the undulating wooded country and entered a more hilly district, formed by an outcrop of massive granite running north and south, and marking the junction of a much-altered sandstone formation tilted on edge. Our hopes that we had cut ourselves clear of the small-pox were here doomed to disappointment. To make matters worse, a trackless wilderness lay between us and Lake Bangweelo, the point towards which we were then making. But delay would only have brought us a crop of new troubles; and in spite of everything we elected to push on, in the hope of reaching Chitambo's before we called a halt.

It would be hopeless to attempt to depict the anxieties and worries of that wretched march through the forest. Every day began a new chapter in the story of disease and death; every day fresh victims were to be seen wearily dragging themselves in the rear of the caravan. The temporary porters we engaged deserted. Loads had to be augmented till the healthy men threatened to break down, and by-and-by there was nothing for it but to leave the goods behind. What disturbed us as much as anything under the circumstances was, that Bangweolo, as marked on our maps, receded before us like a mirage. On September 28th we had reached lat. $12^{\circ} 30' S.$, and should have been on the borders of the lake, and north of Chitambo's if our maps were correct, whereas only the River Molemba flowed past us. Our so-called guide, when interrogated, merely stared, and smiled with irritating vacuity. Clearly he was as much astray as we were ourselves.

We were now in very hard straits in every way. Map and guide alike failed us. No path traversed the forest, porters were played out, and food was exhausted. One man had already found a forest grave, and numbers were ready to follow him. All that we could do was to push on north in the faith that the lake must turn up somewhere in that direction.

Our next march was a very long and trying one, without water. Late in the afternoon we reached one of the remarkable sponges which characterise this region in the wet season. Unfortunately, the sponge was dry, although after much digging and hunting we succeeded in getting as much muddy water as sufficed to slake our thirst. You may imagine how exasperating it was for us, situated as we were, to look at our map and note that according to it we were now camped in the lake, and where there should have been "water, water everywhere," there was "not a drop to drink." Moreover, the men had now been two days without food, and everything was going from bad to worse. Two porters were unable to move, and many loads had to be left behind. Our look-out could not well have been worse.

On September 28th, as we pushed doggedly on our way, our hopes were revived by coming first upon some old plantations, then upon a disused path. Gladly following this track, we suddenly emerged from among the trees upon a flat grassy plain of considerable extent. On the further side great clumps of reed and wide stretches of papyrus indicated the probable course of a river. By-and-by we met a native, and from him learned that we were on the banks of the Lulimalu, and that at no great distance ahead was the village of Chitambo. True enough a few miles further and our immediate troubles were over, and soon we were safely camped in a shady grove, and liberally supplied with food and water.

We had indeed reached Chitambo's, but our disappointment may be imagined when we discovered that the Chitambo's of to-day is not the

village where Livingstone breathed his last. Chitambo himself was dead, and his sons reigned in his stead—but not in the same place. They had established their new village 20 miles to the west, so that we were still separated by that distance from the sacred spot we so much wished to visit. Our plague-smitten caravan, however, could not be left for a day, for we ourselves had practically to be the quarantine police, to watch over the well-being of both sick and healthy. The best we could do under the circumstances was to send our most intelligent and trustworthy headman to visit Old Chitambo's with a guide. He returned with the account that the tree under which Livingstone's heart was buried still spreads its protecting branches over the spot, displaying unharmed the inscription cut deep into its bark by the great traveller's faithful followers. To prove this, the Swahili exceeded his instructions so far as to bring back with him part of one of the letters, as well as a few leaves and a fragment of an old box. The former I have placed in the hands of Livingstone's daughter, Mrs. Bruce.

At the New Chitambo we were camped in long. $30^{\circ}7'$ east, and lat. $12^{\circ}14'$ south, and yet Lake Bangweolo was neither to be seen nor heard of. We were still in a thin forest country, whose distinguishing feature was the numbers of colossal conical ant-mounds rising above the plain 20, 30, and even 40 feet, with a diameter at their base to correspond. These remarkable mud cones were always covered with bush and trees, and presented a very striking spectacle. The forest and ant-mounds continue to a distance of 7 miles north of Chitambo; then follows a great dreary prairie, with a tree here and there, but very few and far between. This is the country of Lunga, which can boast of but one small village, inhabited by Ba-bisa.

From these observations it was made clear to me that as far north as lat. $11^{\circ}55'$ south there is no lake in the dry season. The most careful and persistent inquiry elicited the following information:—The Lulimalu flows west by north from Old Chitambo's to the neighbourhood of the new village; thence it trends west-north-west till it joins the Luapula after receiving the streams Moenda and Lokulu. A few miles further north, somewhere between lat. $11^{\circ}50'$ and 12° , the Chambeze also joins the Luapula after receiving the Rivers Lombatwa and Lolotikila. Consequently, in the dry season it does not enter Bangweolo at all. In the wet season, however, a striking change takes place, and once more the Lake resumes pretty nearly the geographical features represented on our maps, though not extending so far south. Its level, then, according to my observations with the mercurial barometer, is 3750 feet, 250 below the height given by Livingstone, and 500 lower than that observed by Giraud. A consideration of the instruments used will best determine which observation is most reliable, and the settlement of the question must be left to impartial geographers.

There is still another correction of some interest to be made in the

geography of this region. Livingstone did not die in the district of Ilala, but in that of Kalinde. Ilala lies to the west along the Luapula.

As illustrating the rapidity with which a journey to Central Africa can now be made, it may be here mentioned that if the time spent at the Cape and at Kotakota be deducted, we had reached Bangweolo in the short space of three months and a half from the time of leaving England.

Our short stay at Chitambo's was productive of a considerable improvement in the condition of most of the sick men, although five of them died there. No new cases had occurred, and we felt justified in once more resuming our journey, time being now of the utmost value. We struck camp on October 5th in a tolerably hopeful mood, though our caravan presented a wretched spectacle, with its long tail of sick porters. We found only too soon, however, that we had reckoned without our host, matters rapidly becoming worse as we proceeded, till at length there was hardly a march without a death on the road, hardly a camp that was not marked by a porter's grave. This was bad enough, but when the alarm spread before us, and we were boycotted, quarantined, and threatened by the natives, who rose in arms against our progress, matters seemed very black indeed. It was only by maintaining a determined front, and by much display of weapons, that we were enabled to push our way onward at all.

And but for that loathsome disease which had fastened its deadly clutch upon our caravan, how pleasant would have been our march. Our way lay through the light forest of Kalinde and Ilala, where stately roan antelopes and great herds of tsessebe watched our passing among the huge ant-mounds. In two days we reached the Luapula, where it sweeps swiftly and majestically, 150 yards broad, from marshy reaches, gleaming with pools and backwaters, and a great series of reed and papyrus-clad islands, into a well-defined channel.

For three more marches the river's course was ours. After the restricted view of the dreary forest wilderness, how delightful it was to travel over the bordering grassy plains, winding round handsome clumps of trees, startling from their midday lair the graceful Vardon's antelope, the water-buck, the whistling reed-buck, and the zebra, lingering by the water's edge to scan some lovely bit of gleaming river, while here a huge ant-mound, there a group of palms, gave an additional flavour of Africa to the beautiful landscape.

Meanwhile we failed not to take due note of the geographical features of the country. Across these verdant meadows rolls the Lohombo River from the mysterious unexplored forest, bringing the streams of Bisa and Ulala to join the Luapula. Further on the Moengashe adds its watery tribute, drawn from the hills and dales of Iramba. Immediately south of the Moengashe the alluvial plains end, and the land gradually rises to some 300 feet above the river-bed,

while the river itself, no longer allowed to wind and linger at will through low verdant meadows, becomes contracted to a breadth of some 70 yards prior to entering a narrow gorge, through which it rushes with great force and swiftness. By-and-by, at Kalonga, the village of the principal chief of Iramba, it spreads out again in wide island-studded reaches, and subsides to quieter progress as it begins its great bend, first north-west, then north, to Lake Moero.

At Kalonga we and the Luapula parted company, our aim now being to reach the Kafue Valley away to the south and south-west. Our route led us over the finest wooded district we had yet traversed, as we ascended towards the watershed of the Congo and Zambesi, crossing the streams and tributaries of the Lukutabwa and the Luembe. We were now in the full bloom of spring, and the rolling uplands of Iramba were decked with a profusion of flowers rarely to be met with in the Tropics. The mimosa, blushing no longer with new-found life, mingled its green leaves with the flowery sprays of convolvulus and clematis. *Amaryllis*, *gladiolas*, and *tritomas* raised their crimson heads with a certain stately elegance above the humbler composite, orchids, and *polygalas* more modestly nestling among the new grass. Many sweet-scented bushes filled the air with their fragrance in the shade of the trees, and in higher places proteas claimed possession of the soil.

Among these fertile uplands, where wooded ridge alternates with grassy hollow, the sable and the roan antelopes, the noble eland, the forest-loving kudu, and the konze love to wander, and are but rarely disturbed by the hunter. Over the whole country reigned a fascinating mixture of types both temperate and tropical; here, some modest composite flower carried our thoughts homeward; there, a startled antelope, the spoor of an elephant, or a stately palm brought them swiftly back to Central Africa.

At the small village of Kwa-Kavoi we found ourselves near the watershed of the country, and at the edge of a trackless forest wilderness, stretching away south into the valley of the Kafue. Here we were unable to obtain a guide, nor was any information to be obtained of the country ahead. It required but a look at our terribly diminished caravan, and our long line of sick, to show that it would be worse than folly to proceed further into that region, destitute alike of paths, food, or inhabitants. By this time, too, I had fallen a victim to what was then to me a mysterious disease, which robbed travel of more than half its joys, and roused the gravest forebodings as to how it would end.

Under these discouraging conditions we elected to keep more easterly than south, hoping to outflank the impassable forest. Even here we were confronted with a trackless wilderness; but a guide was forthcoming, and we were consequently inclined to make light of that difficulty. It proved a very different matter, however, when on the very first march we found ourselves deserted by the guide in question, and

were left with nothing but vague indications to go upon in finding our way to an inhabited region. For four days we had to travel thus, pathless and guideless, and then, happily, just as we began to feel the pinch of hunger and the stings of doubt, we emerged from the forest, and found ourselves once more among cultivated fields.

It was more unpleasant to discover that we were once more within the pestiferous sphere of influence of the slave-raiding half-caste Portuguese from Zumbo. We hear much of the ravages of the Arabs on the Congo. I should like, if circumstances permitted, to describe to you the ghastly work carried on by men with European blood in their veins, which has spread death and desolation over many thousand miles of the Zambesi Basin. We had soon unpleasant evidence of the reputation the Shakundas, as they are called, had acquired. Invariably we were assumed to be of the same race, and to be engaged on the same bloody mission. Our appearance was the signal for the usual frenzied war-cry, the gathering of excited warriors, and the flight of terror-stricken women and children. It was all very well in its way to have confidence that everything would come right; but, meanwhile, there were the uncomfortable half-hours or hours in which we had to sit with smiling faces and persuasive voice, surrounded by hundreds of men in every conceivable form of mad excitement, ever fearing the occurrence of that slight accident which would end so fatally for all. Indeed, looking back upon these anxious moments, one can but wonder that the still small voice of peace ever rose above the threatening clamour, and acted like oil upon troubled waters. Yet so it always was; and everywhere we left friends where we had met, apparently, deadly enemies.

From Pa-Mkwemba we passed south for three marches, following the Moengashe. On the fourth we crossed by a gap, at an elevation of 4500 feet, the Kalera Hills, which here form the dividing line between the Congo and Zambesi Basins. We now struck upon the Lunsefwa, a fine stream, rapidly growing into the dignity of a river as it flowed south to join the Mulungushe and the Loangwa. A range of hills, called the Irumi Hills, struck away south from the Kalera Range, and helped to give a more rugged aspect to the landscape than the succession of grassy plains and wooded uplands to which we had lately been accustomed.

On November 4th we reached the village of the important Iramba chief Mshiri. From this point we proposed to strike west to the Kafue River and the Mashukulumbé by way of Manica; but our plans were, unfortunately, doomed to be upset. Our Atonga porters, desperate on finding their faces once more turned westward, mad with homesickness, and moody with the loss of so many friends and the sight of so many sick, were suddenly inspired with the courage of wild animals at bay. Expostulation, promises, and threats were alike in vain; though 400 miles of to them unknown country lay between them and home they

determined to face all the dangers of murder, slavery, or starvation rather than move one mile further in the opposite direction. So much in earnest were they that I am convinced nothing could have prevented them from putting their resolve into execution short of the guns of the Makua, who at this juncture, though discouraged, were still faithful. At length one night the whole contingent vanished from camp without a sound, and were only caught up and stopped by the promise of a palaver. On reviewing our position it seemed indeed that our only course was to return. Already we had lost more than a third of our men with small-pox; a large number were still suffering; and at that very moment the disease had burst out again with renewed violence. The wet season was now commencing, with all that meant of additional delays, hardships, and unhealthiness at the best of times, and I myself was rapidly breaking down under the illness that had taken hold of me.

However reluctant we might be, we could not but admit that to proceed further under such conditions would savour of recklessness. We determined, therefore, to yield to the inevitable, but on condition that a small number of the men should accompany me as far as Manica, Grant and Wilson remaining behind as hostages of our good faith.

This arrangement was accordingly carried out without delay, and, in spite of daily-increasing illness, I travelled through Urenje to the borders of Manica and back, a distance of close upon 180 miles, doing an average of 20 miles a day. The only incident of the trip which I need allude to here was the meeting with a Portuguese slave raider from Zumbo, whose compound was crowded with young girls and boys, the result of an expedition into the Kafue Valley.

On the tenth day I got back to Mshiri's, and not a moment too soon, for the small-pox had spread to the village, and among the victims was the son of the chief. Regretting sincerely that Mshiri's hospitality should have cost him so dear, we hurriedly completed our preparations, and on November 18th commenced the long return journey to Nyasa.

I must touch but lightly on the events and sights which marked our eastward way. For the men it was a joyous journey, and in spite of rains and mountains and long marches, the small-pox disappeared before their recovered spirits. For myself, it was one long period of torture, every step marked by a throb of pain. Happily, Grant had finally conquered the microbes, and Wilson had never known a day's illness. Both rose to the occasion, and showed they could get on quite well without me—a discovery at once pleasing and humiliating.

With our journey eastward the country began to assume new aspects. Deeper dales cut across our path, steeper and more rugged ridges tried our lungs. To right and left appeared various ranges of mountains, at first distant, then near, each growing loftier and more picturesque the further we advanced.

Our route lay south-east across the Lunsefwa, now an almost unford-
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able river, to the Chifukunya Mountains, then north-east to the foot of the irregular range which more or less marks the watershed of the country. Thenceforth to the Loangwa there were no more rolling uplands; all was high mountain and deep glen. From points of vantage we from time to time obtained splendid views southward over the great valley scooped out from the centre of the plateau by the fine River Lukosashe and its numerous large tributaries, to the rocky heights beyond. From an altitude of 3600 feet we rapidly descended to 1300 feet on the Lukosashe, then climbed wearily upward again to over 4000 feet, and crossed the sharp crest of the great Muchinga, after which we sank again to 1300, and were able to drink of the waters of the Loangwa.

At Chilumbangere's we found the wide valley of the Loangwa contracted into a narrow neck by the enclosing mountains. Here we had hoped to have proceeded west to Blantyre, but Matakanya had transformed the beautiful country into a trackless wilderness, for which no guide was to be had. Consequently we were compelled to direct our steps in the direction of Mpeseni's. The expression "our steps" is scarcely correct, for by this time I had to make use of other than my own legs, and submit to the painful ignominy of being carried.

For the first four marches we skirted the base of a range of mountains gradually rising in altitude eastward. For eight more we crossed a succession of hills and glens of varied aspect, but always pleasing and fertile, bringing us at length to Mpeseni's. Here the magnificent possibilities of the fine plateaux we had traversed were made manifest in the dense population and great herds of cattle which the land supported. Our admiration, however, was solely confined to the land, for man in these parts proved to be vile, and Mpeseni vilest of all. For three days we had a most unpleasant time of it in the clutches of this bloodthirsty savage, and failing to get into more friendly relations, we proceeded to a place where a German trader had established his headquarters. On the road a determined attempt was made to plunder part of our caravan. Happily, Grant was at hand, and although armed only with a stick, succeeded in rallying the porters and driving off the warriors. We fortunately suffered no serious loss, though one of the enemy was speared—the first blood shed, by the way, on any of my six African expeditions.

At Wiese's, the German trader before alluded to, matters became worse. We learned that a general muster of warriors had been summoned with the object of attacking us. Nothing was to be gained by fighting, and much might be lost; therefore, deeming discretion the better part of valour, we resolved upon a midnight flight. The flight was by no means unaccompanied by danger—the possibility of such a move on our part having been foreseen by the enemy, and a line of pickets placed across the narrow valley of the Mbarashe. Happily, after

several narrow escapes, we contrived to pass unobserved, and before we stopped we placed little short of 30 miles between us and Wiese's.

On December 30th we camped at the base of Kasungu Peak, and spent the first day of the year 1891 in the hospitable village of Mwasi. Two days later we were once more under the shadow of Chipata, and looking down upon Nyasa. Soon we had reached the low grounds, and, crossing the fields of maize and rice, re-entered Kota-Kota on January 4th, thus bringing to a close our long journey of 1200 miles.

At Kota-Kota we had again a dreary wait for the *Domira*, and it was not till February 18th that we reached Blantyre. Here I surrendered myself to the care of Dr. W. Scott, of the Mission, who, I need hardly say, treated me like a brother. Grant went on to the Cape. Wilson, on the other hand, set off, under my instructions, on a short trip to the west of Katunga. He did his work successfully, but only came back to die of fever after having come through the longer journey scatheless. It was the oft-told African story of a bright and promising career brought prematurely to a close.

In the beginning of August, Grant returned from the Cape and found me on my feet again, but nothing more. He brought inspiring news of further fields to conquer, this time to the west of Bangweolo. That proved a charm more stimulating than any medicine, and under its influence we had everything prepared in a fortnight, loads in the *Domira*, and porters ready to follow. Another day and we should have been off. But at the very moment of departure came countermanding orders, and with a sigh I was fain to turn my face homeward, instead of starting for fresh woods and pastures new, with the happy chance, as Mr. Johnston puts it, of "dying picturesquely in Africa."

I left Blantyre in the middle of August, and reached England on October 18th of last year, while Mr. Grant remained behind to see a little more of African life, though, happily, he is once more among us to-night. If he has failed to acquire his father's fame, it is not through any want of the same high qualities, but simply because he has unfortunately fallen upon a time when a visit to the sources of the Nile, or to Lake Bangweolo, has become one of the commonplaces of travel.

As an appendix to my narrative it may be not altogether valueless to summarise my conclusions about certain aspects of the country traversed. Let me commence with the land.

The general characteristics of the plateau lands to the west of Lake Nyasa are markedly those which prevail in the Shire Highlands, though it seems to me that the average value of the former is considerably above the latter. There is the same free red loam, the result of the denudation of the metamorphic rocks which predominate over the Central African Plateau; the same light forest, free from undergrowth and yet not degenerating into thorny scrub or bush. Its high average value seemed to me quite exceptional for Africa, so much of which is either hopelessly swampy or as hopelessly arid and sterile. Neither the one nor

the other prevailed in even a minor degree over the whole of these favoured uplands, and I consider myself well within the mark when I say that more than three-fourths of the country we traversed is capital agricultural and pastoral land. In this respect it is important to note that the dreaded tsetse fly was nowhere to be seen, except on the low plains bordering the Loangwa. The fact that cattle were found everywhere is even more conclusive proof of its non-existence in the Highlands. Blantyre shows what the land is capable of from an agricultural point of view, while Mpeseni's country amply illustrated its pastoral possibilities. By comparison with these two places I could not but draw the conclusion that thousands of miles of these plateau lands were fit for the planter, and that over them might wander countless herds of cattle and flocks of sheep, fearing neither lack of water nor food, neither overpowering tropical heats, nor yet the deadly tsetse fly.

From the point of view of climate my conclusions are equally favourable.

We have here a region which does not come inconveniently near the equator, while, with a general elevation of nearly 4000 feet, it makes up by altitude what it loses by distance from the temperate zone. The climate may claim to be described as a temperate one. We travelled in the hottest time of the year and yet we never found the days oppressive. On the other hand the nights were always deliciously cool—frequently cold. The very hottest recorded during our journey was at Bangweolo, and then the thermometer only rose to 94°, with a morning temperature of 55°. During the dry season bracing, cool breezes from the east blow all day long. There were no mosquitoes, except in the Loangwa Valley, and that of itself speaks volumes.

With regard to the rainfall, there are no statistics available except those taken at Blantyre. In different seasons it varies from about 50 to 70 inches. The amount, therefore, is not great, and except for a few hours now and then, or, a whole day occasionally, outdoor work is not stopped. As far as we were able to observe and infer, the conditions further west are very much the same. If anything, the rainfall becomes greater towards the west.

From the point of view of health, the whole country must be said to be exceptionally good for Africa. Blantyre has been amply proved to be a place where no European need be afraid to settle, and yet undoubtedly the plateau lands westward are still more healthy. Unlike the former there is no low-lying malaria breeding-grounds near them; there is a generally higher elevation, and therefore a lower temperature; drainage is excellent, and pure water is to be found everywhere.

Of the geology of the region we traversed only the very broadest outlines can be given here. The greater part of the country we explored consists of metamorphic rocks. All degrees of metamorphism are found, but quartzites, schists, and gneiss, are the predominating rocks. Through these syenite and granite break their way in considerable masses, forming not uncommonly picturesque peaks, domes, and ranges of hills; the numerous quartz veins form a very special feature in the geology of the region, and the indications of mineral wealth were most striking.

Besides the metamorphic rocks, there are three considerable areas of sedimentary strata overlying and occupying great hollows in the older series, and representing the deposits of former lakes. Thanks to the lesser power of the sedimentary rocks to resist denuding influences, the latter are, being largely worked away, revealing the original hollows in the older rocks, which now form the valleys of the Loangwa and the Lukosasse, the depression partly occupied by Bangweolo being the third area. Red sandstone, shales, and marls, in which lie remarkable fossil trees, are the prevalent rocks of the Loangwa Valley; beautiful white and yellow sandstones, with

slightly metamorphosed clays, compose the Bangweolo series, while a coarse-pebbled grit predominates in the Lukoshashe area. Through lack of distinctive fossil evidence it was impossible for us to determine the geological horizon of these strata.

About the inhabitants it is impossible to say much in the limits of this paper. In the country between Nyasa and the Loangwa the people are almost entirely composed of various sections of that large group of Bantu negroids named Wa-Nyasa, and now almost entirely ruled over by Zulu chiefs. West of the Loangwa, as far as the Luapula and the Kafue, the people are divided into closely allied tribes, speaking a common language with dialectic differences, but slightly removed from that of the Wa-Nyasa. These tribes are the Ba-bisa, to the east and south-east of Bangweolo, the Ba-usi to the west of the lake, the Ba-Ulala to the south, the Ba-iramba to the south of the great loop of the Luapula.

Between Nyasa and the Loangwa we found but two areas well populated—those of Mwasi and Mpeseni. The Loangwa-Kafue Plateau on the other hand was remarkably thinly populated. Our average experience was to travel from



*The shaded part shows sedimentary area.
The unshaded part metamorphic with intrusive granite.*

GEOLOGICAL SKETCH-MAP OF CENTRAL AFRICA.

40 to 60 miles to find a small village, and then as much more to find a second. The explanation is to be found in the fact that each village was a law unto itself. There was no common cause made among the villages of the same tribe, and consequently they were eaten up piecemeal.

The prefix Kwa- means "village of"; thus Kwa-Kenundu is the village of Kenundu the chief. In some cases Pa- takes the place of Kwa-, as Pa-Mkwemba.

It is important to note also, from a geographical point of view, that the natives are continually shifting their residence, so that we found no village that could claim to be over ten years old, while every village I have marked in my map will be found shifted by future travellers as much as 10, 20, or more miles. It is therefore clear that their positions have absolutely no geographical value.

A few words about my map and I have done. My route has been carefully worked out by dead reckoning, checked by astronomical observations. By the latter the latitudes of 54 positions were determined. The altitudes have been calculated from aneroid observations, checked repeatedly by the boiling-point thermometer, but more especially George's mercurial standard barometer. For all points of the slightest

interest the altitudes were determined by the last-named instrument. Mr. Coles, the Society's map curator, worked out the observations, and it may therefore be taken for granted that that part of the work has been well and faithfully done.

I here venture to make a suggestion, namely, that the name of Livingstone be given to our sphere of influence north of the Zambesi. At the present moment the name of our greatest African traveller finds no place in the map of the Continent—which he did so much to explore directly, and still more indirectly—except as applied to a deserted mission station on the shores of Lake Nyasa. An opportunity, however, is now open to us to wipe out this reproach. Within the last two years a huge area north of the Zambesi has been coloured red on our maps. Sometimes this gets the clumsy title of British South Central Africa, at others the somewhat better one of Northern Zambesia, though not properly applicable, since it includes a part of the Congo System. Surely Livingstonia would be better. Nothing, too, could be more applicable, for Livingstone made the region in question peculiarly his own. He marked it out by his explorations, forming a ring in which there was but one small gap, left between Bangweolo and the upper course of the Zambesi. The exploration of the Zambesi is his, and that river forms the southern and western boundaries of British South Central Africa. Its eastern boundaries he marked out when he passed up the Shire and sailed on the waters of Nyasa. His last great work about Lakes Tanganyika, Moero and Bangweolo determined the northern boundary lines. Finally in this region he died, and his heart lies buried in one remote corner, while his wife found a grave in another. There, too, are his dreams, becoming realities in the work of the Scottish Missions, the African Lakes Company and the planters. Everywhere we find his spirit stimulating traveller, missionary, trader and planter alike; and yet, as I have remarked, we find his name attached only to an unhealthy deserted mission station.

We have now the special sphere of Livingstone's great influence seeking a name. Can we possibly let the opportunity pass without putting his to it? No historical European name or characteristic native one will be displaced by that of Livingstonia. Instead, it supplies a felt want in a most agreeable manner, and in thus honouring Livingstone we will honour ourselves.

The PRESIDENT remarked before the reading of the paper:—Before I ask our friend Mr. Thomson to read his paper, I should like to call your attention to the fact that we have to-night by very much the longest list of new fellows elected that we have ever had during the long annals of this Society. On the corresponding night of last year we elected seventy fellows, which was more than we had ever elected before. To-night there are, as you have heard, 109. Last year we announced on the same night nine proposals; to-night there are no less than forty. Without further preface, I will call upon Mr. Thomson, who has returned from his sixth expedition, after having walked in his various journeys over 18,000 miles in Africa, to read his paper.

After the reading of the paper, the following discussion took place:—

MR. J. A. GRANT: After the very interesting paper which we have just heard from Mr. Thomson, it seems almost superfluous for me to make any remarks. Mr. Thomson has very eloquently described to you the country through which his kindness permitted me to travel, and I think there is no point in the paper which he has read to you to-night which I could in any way criticise, and there is nothing left in the journey, so far as I can remember, which he has not brought before you, and which would be of interest from a geographical point of view. The paper which he has read makes me almost feel that I could be again in that most fascinating

country, going through the scenes he has so truthfully and graphically described. One point in the paper we have just heard opens a topic of great interest at the present time. Mr. Thomson told us that within three-and-a-half months of leaving England he reached the shore of Lake Bangweelo. Now this in itself is a novel and interesting fact, but still not of much importance if it did not point out to us that the centre of Africa is not so very remote and inaccessible as commonly supposed. I think that at the present time by common consent we are agreed that the centre of this dark continent, this darkest Africa, must see the light of civilisation and humanity. We hear of railways which are to be built, to aid in this great work, and railways doubtless are necessary. But I would call your attention for a moment to this route into Central Africa which Mr. Thomson employed on the occasion of his last journey from the mouth of the Zambesi to the north end of Nyasa. It is of the greatest convenience to those who wish to enter Central Africa, for we have a permanent waterway which nature has given us of 700 miles from the mouth of the Zambesi to the north end of Lake Nyasa. It is not exactly an unbroken line of communication, for in the Shire, as you know, there are the Murchison Rapids which extend over a distance of nearly 60 miles. From the north end of Nyasa to the south of Tanganyika you have but a fortnight's pleasant journey over a beautiful plateau, when a lake of 400 miles in length stretches out before you, at the north end of which we are within measurable distance of the Victoria, within easy distance of what is perhaps the most interesting part of Central Africa. It looks almost as if nature in her bounty considered the African Continent too broad, and gave us another coast-line in Central Africa, passing by some countries which have already proved to be most fertile and beautiful. One rider to add to this route is the drying up of the lakes, and consequent lack of water in their outlets. When Dr. Livingstone went up the Zambesi, he reached Katunga, the port of Blantyre, in a boat drawing, if I mistake not, 5 to 6 feet of water, but at the present time it is with the greatest difficulty that a boat drawing 2 feet can get up to that place, and on the shores of Lake Nyasa native testimony corroborated what we saw on every side manifest, signs that the lake is surely and steadily failing. This is a most interesting and difficult question, but it is not for me to discuss to-night. The most feasible explanation to me seems cycles of rain. At the present time the lakes in this district are steadily failing; we can but hope that again the rain will come and the lakes fill up. In the paper which has been just read there is another point which I will detain you for a moment to discuss. Mr. Thomson said when he was laid low by sickness that Wilson and I rose to the occasion and took his place. Well, gentlemen, poor Wilson, I am sure, would be the first to join with me in saying that, although the sickness laid Thomson low, that pluck and discrimination which have placed Mr. Thomson in the foremost position among African travellers still made him the guiding star of our caravan. But it remains for me to express my gratitude for the kind way in which you have received me, knowing as I do that it is due to the memory of one who is no longer amongst us, one who for over thirty years enjoyed your confidence, and who was so proud of your unvaried kindness.

Commander V. L. CAMERON, R.N.: I wish to congratulate Mr. Thomson on his return to health, and on his being able to be here to tell us his story of this interesting journey. I also wish to congratulate the son of my old friend, Colonel Grant, on his safe return to Europe, and on the way in which he has spoken before us to-night. The journey, which has been so graphically laid before us, is one of great interest. Of course we knew something of the country from previous travellers, but it has been laid before us to-night in detail, never before equalled. One of the things which may have an important bearing on the future of this country, is the position of the

Muchingo Mountains, but which has never been definitely laid down. If nothing else had been done but this, a very important result would have been achieved. I think once before, when congratulating Mr. Thomson on his journey through Masailand, I saw that he had discovered a country fit for colonisation; so again here I can congratulate him on having laid before us a country we English can go and open up, and I think I may be allowed to congratulate him most heartily on the great results which he has achieved.

Dr. MALONEY: I have listened with very great pleasure to the instructive account of Mr. Joseph Thomson's travels, and I have only to endorse, as far as my personal experience goes, everything he has said. This great extent of country only requires civilisation to make it one of the greatest countries of the Earth; but it is evident that civilisation can only be introduced by opening up the country, and nature has already provided a way of entry, as both Mr. Thomson and Mr. Grant have mentioned, by the Zambesi, Shire and Lake systems. I hope soon to be able to give an account of our experiences in a recent journey to Katanga or Msiri's country, in which I acted as Medical Officer under the late Capt. Stairs; and here I must stop to say that a nobler, braver Englishman than that officer never existed; and I fervently wish that he might have been here to-night to give the world some idea, through this meeting, of the work he performed on this expedition. Mr. Thomson has remarked on the condition of some parts of the country devastated by the slave trade. We ourselves in passing through that part of the country, from Lake Moero to Tanganyika, saw many evidences of the presence of the Arab slave-dealer; but I think that the advent of fixed government and legitimate trade will change the habits of this gentleman, and that he may, under a new state of affairs, become a benefit to, in the place of being the curse of Central Africa. I have only to conclude by saying, that so long as we have men like Mr. Thomson, who in spite of serious and painful illness can do such work as he has done, we may safely say that the future of this great country is assured; and I feel sure you will all join with me in wishing him a speedy return to health and the work to which he has devoted his life.

Lieut. CRICHTON BROWNE:—Having been once Lieutenant to Mr. Joseph Thomson, serving in one of his expeditions and having considered myself privileged in so doing, I beg to be permitted to congratulate him on the interesting paper which he has read, and his restoration to health after a severe and prolonged illness.

Mr. AUNOT: I hope Mr. Thomson will be able to show us clearly all the advantages of this route to the interior, as to the cost of transport and the possibilities of procuring carriage for the use of intending passengers. The difficulty usually is where and how to get carriers. As may be known to this society, I have been for a few years occupied in reaching Garenganze in the Katanga country to the west of Bangweolo, and have found at the port of Benguela, as it were, the soft end of the coconut. The whole west coast of Africa is comparatively inaccessible, but by means of cultivating friendship with chiefs in the interior we are able to procure fresh carriers; and I may mention here that one of the great difficulties of African travel would be removed if some simpler way of carriage could be devised. Is there no remedy but a railway, no intermediate way? Could not the South African waggon be utilised? It is a question that should be considered by this society. I have followed Mr. Thomson's journey with real interest and can sympathise with him in his efforts at all costs to settle matters peaceably. I could tell you of spending forty-eight hours in the middle of one of these African turmoils, the whole country seemingly bent on bloodshed, and all ending in peace. The Africans remind me much of the simple Irish character, ready to fight on the slightest provocation, but so soon as they understand you are a man of peace they welcome you with friend-

ship and cordiality. Above all things we want men of peace in Central Africa. While Mr. Thomson's carriers were suffering from small pox, I was a few hundred miles away beleaguered, similarly with a caravan of three hundred porters. We had two hundred cases more or less severe and only twenty deaths, but we had sufficient food; and by nursing the men carefully and giving them plenty of rest, after a very small percentage of loss we were able to resume the journey again. In closing my remarks I must congratulate Mr. Thomson and Mr. Grant on their successful journey.

Commander KEAKE, R.N. : I had no intention of speaking at all when I came, but was only going to listen to the story of a very well-managed and successful journey by my friend Mr. Thomson. I was at Blantyre when he returned, and am very pleased to say Mr. Thomson looks much better than he did then; I am also very pleased that my friend Mr. Grant has spoken of that interior route. I have long been impressed with its value and have done my best to impress it upon others. You have only to start at the mouth of the Zambesi and with little or no difficulty find yourself in the Mediterranean. I am pleased to be able to tell you that H.M. Government are well forward in this matter. I hope to be able to place three gunboats flying the white ensign on Lake Nyasa before October next. Give us one more gunboat to put on Tanganyika, and Ujiji becomes the port of Uganda, and as I have said before, the nation that holds that waterway holds the key to the whole mass of land. In this I am very interested, and am working hard that I may be able to assist to get goods, food and everything else, not overland, not on men's heads, but in boats, and I think we shall succeed.

The PRESIDENT : After every speaker has congratulated Mr. Thomson upon his extremely interesting journey, his extraordinary personal endurance and upon his restoration to comparative health, you will all wish me to do the same in your name, and you will include, I doubt not, in your thanks all those who have spoken to-night, most especially Mr. Grant, whom we hail as a worthy son and successor to one of our oldest friends and one of the greatest heroes of African travel.

Mr. THOMSON'S MAP.—Mr. Thomson's route having been plotted by the explorer himself, from his bearings, distances, and observed latitudes, has been adjusted to the following points determined by astronomical observations, viz:—

	°	'	"	°	'	"	
Blantyre	15	45	29	S.	35	3	54 E. (H. E. O'Neill)
Matope	15	22	15	S.	34	56	9 E. (James Stewart)
Livingstonia ..	14	1	52	S.	34	52	32 E. (O'Neill and Stewart)
Bandawe	11	55	55	S.	34	12	53 E. (mean the same)
Kawende Point ..	11	32	0	S.	29	47	45 E. (Lieut. Giraud.)

No difficulty has been experienced in connecting Mr. Thomson's new route with the routes of previous explorers, and especially with those followed by Captains Capello and Ivens.

The following statement with regard to Mr. Thomson's altitudes is made by Mr. John Coles, the Society's Map-Curator:—

The observations from which these heights are computed have been very carefully and systematically taken. In the computations I have, in all cases, corrected the readings of the aneroid for the errors shown by comparison with the mercurial barometer, or B.P. thermometer. I have also applied corrections for the daily range of the barometer and thermometer and also for the latitude. The data given in Hann's Meteorological Charts have been used for the lower station, and as these are only general means, the absolute altitudes above sea-level determined by them must be considered as approximates; the difference of level between different stations is, however, very nearly accurate.

JOURNEYS IN THE BENIN COUNTRY, WEST AFRICA.*

By Captain H. L. GALLWEY, H.M. Vice-Consul to the Oil Rivers Protectorate.

THE part of the world that I am going to speak about is the Benin country, West Africa. Owing to the want of proper surveying instruments I was very much hampered in my mapping work. On my return to Africa, early next year (1893), I hope to be able to furnish the Society with more reliable maps of this particular region.

It is extraordinary how little appears to be known about the Benin country. Dapper and Barbot, geographical writers of the 17th and 18th centuries, give a certain amount of information on the subject; but their works were for the most part compiled from the observations of others, and not from personal experience, and consequently their statements can only be accepted with a certain amount of caution.

The Benin River is the western boundary of the lately-formed Oil Rivers Protectorate, the mouth being situated about long. $5^{\circ} 3' E.$ and lat. $5^{\circ} 46' N.$; the general course of the stream is west-north-west. Like all African rivers on the west coast, the Benin River is approached by a bar, the width of the navigable part being about half a mile, with a depth of water at high tide of from 13 to 14 feet; consequently only small steamers drawing up to 12 feet of water can enter the river by the mouth. Large steamers have to enter the Forcados River, proceeding from thence to Benin by the creeks. These creeks are very difficult to navigate owing to their tortuous nature, there being sharp turns every few hundred yards. The river is about 2 miles wide at the mouth, narrowing by degrees to $1\frac{1}{2}$ mile at Batare, 1 mile at Young Town, $\frac{1}{4}$ mile at America, and dwindling down until it is only about 30 yards wide, and sometimes less, above Aruca; but widening a little at Sapele. Here a bifurcation takes place, one arm having been named the Jamieson by a gentleman of that name in 1839, and the other the Ethiope by Consul Beecroft in the following year.

To return to the mouth of the river. The whole of this part of the coast is one extensive mangrove swamp, intersected by a network of creeks. Very little solid ground is to be found, there being only occasional patches here and there. These mangrove swamps are veritable hot-beds of fever, and in consequence this part of the West African coast ranks among the most unhealthy places in the world. After crossing the bar, and ascending the river for about 5 miles, we come to the European factories, which are situated at intervals for several miles along the river, all being on the right

* Paper read at the meeting of the Royal Geographical Society, December 5th, 1892.

bank. A factory consists of a dwelling-house, substantially built and very comfortable, warehouses, and stores. In the olden days the traders lived in hulks; but these are now entirely replaced by very commodious houses. In fact, a great change has come over the life of a West African trader of late years. Pleasant social gatherings, in the shape of cricket, lawn tennis, and such pastimes, now take the place of the debauches of the past.

In the days of the Portuguese supremacy trade was almost entirely confined to slaves and ivory; now palm-oil is the chief production. Very little ivory comes down the river. A large trade is also done in palm kernels, although not in the King of Benin's dominion, a fetish veto having always been placed upon it. However, since the conclusion of a treaty between Her Majesty and the King in March last, the latter personage has expressed his willingness to open up the kernel trade. In the same way many valuable trade products are lying untouched in this dusky potentate's territories, owing to the fetish rule of that unfortunate land. It is to be hoped, however, that all this will be changed before very long, although a very great deal of tact and patience will have to be brought into play. A small amount of rubber is exported, but is hardly worth mentioning, although the country abounds in this particular product, as well as in gum copal, gum arabic, incense gums, mahogany, hardwoods, and fibres of every kind. Tobacco, coffee, and cocoa would thrive well, although I doubt whether it would pay Europeans to grow these articles, especially coffee. Until very recently all the factories were at the mouth of the river, but now there are two at Gwato and two at Sapele. Sapele is the point at which the bifurcation of the two arms of the river takes place, and it is here that the Jakri and Sobo tribes join.

The Jakris have hitherto acted as middlemen between the white traders and the oil producers; they naturally resent any white trader establishing a factory up-country, and thereby dealing direct with the oil producers; consequently they do their best to obstruct any move in this direction. Taking these facts into consideration, it will probably be some time before the Sapele factories do very much trade. On the other hand, the oil producers are very anxious to trade direct with the white man; but they are afraid of the Jakris, and will continue to be so until a military post is established at Sapele. The Vice-Consulate has been, and is at present, established near the mouth of the river; but in a very short time it will be moved up to Sapele. This will have the effect of giving confidence to the Sobos, and at the same time an eye can be more easily kept on the Jakris.

To return to the river. During the neap tides the water rises and falls about $4\frac{1}{2}$ feet; during the springs $6\frac{1}{2}$ feet, and even more. The tide runs from 4 to 5 miles an hour. The rise and fall of tide is felt as far as Kanaka on the Ethiope, and Gbiye on the Jamieson. Above these

points the water is always running down. Between Eku and the Sobo plains the current is very rapid, and above that it becomes almost a torrent. A launch drawing 5 feet of water can go right up to Sapoba on the one branch, and Eku on the other, though one has to be very careful to avoid the snags, i.e., sunken trees, which are everywhere.

After ascending the river about 6 miles we come to the Deli Creek. This waterway leads into the Escardos River, and is navigable for launches, but is too narrow and tortuous for even small steamers. In about a couple of miles we reach the Lagos Creek, the entrance to the inland waters connecting the Benin River with Lagos. Last year (1891) Mr. Haly Hutton and I managed to navigate this channel, thereby having the small satisfaction of being the first Europeans to get through by this route. It appears that several attempts had previously been made to reach the Benin River from Lagos, but Arogbo was the furthest point touched. This place is about 50 miles from the Benin River. On the occasion I mention our craft was a large gig-canoe, lent to me by Nanna, the leading Jakri chief, manned by thirty men. Nanna objected to supply me with a crew, as he said that if once his slaves knew the way to Lagos they would all eventually run away, Lagos being a free country. However, a chief named Dore, not having the same scruples, gave me all the men I required.

Leaving the river on a Tuesday (Dec. 7th, 1891) we reached Lagos the following Sunday, thus taking five days to do the 170 miles. We paddled only during the day, i.e., from 5 A.M. to 9 P.M. The region through which we passed was very uninteresting, there being no open country of any kind. The mangrove disappeared about 25 miles after leaving the Benin River, and reappeared about 15 miles from Lagos. As far as Aboto the waterway is very narrow, in some places being less than 10 yards wide; above that place the stream widens, the banks get higher, and the forest scenery is very beautiful. On the evening of the third day we reached the Lekki Lagoon, a lovely sheet of water dotted with islands covered with grand forest trees, creepers, and ferns of every kind. This lagoon is about 30 miles long, and 15 miles broad in the widest part, and was very refreshing after three days of narrow creeks. The natives of the country through which we passed gave us no trouble of any kind, although we had been led to suppose that they might prove disagreeable. In fact Aboto was the only place where they took any notice of us. Here the chief sent a message to know why the white man passed by without calling on him—a message which required no answer.

As regards the future use of this inland waterway, I fear it will not prove of very much value. Some of the grass obstructions that had to be got through were formidable. In many cases the canoe had to be lifted along, and in one place we had to go through about

2 miles of high grass, quite impassable by a launch of any description. In addition to this, the snags, especially near Arogbo, were a decided bar to any craft other than a canoe getting past.

To return to the river once more. Shortly after passing the Lagos Creek we come to two more factories, and a little further on to a narrow creek leading to Broheme, where Nanna, the chief already referred to, resides. This town is very well built, and is quite a model native settlement. It is kept scrupulously clean, Nanna's own house being built according to European ideas. This chief is a superior sort of native, and is very wealthy. He is greatly feared by the neighbouring chiefs. About 10 miles further up the river we reach Young Town, where steamers enter the river after coming through the creeks from Forcados. Opposite Young Town is the Gwato Creek, the waterway to the town of that name, the landing-place for Benin city. I made a survey of the creek, but unfortunately mislaid it. Another 5 miles sees the last of the mangroves, the ground becomes firmer, and the banks higher, the foliage being chiefly palm trees. The scenery varies very little. The river gets narrower and narrower, though there is plenty of water right up to the edge of the bush. Passing a few small towns and villages, we reach Sapele, about 50 miles from the mouth of the river, where the bifurcation before alluded to takes place. Steamers drawing up to 14 feet of water can run up to this place, where there is an excellent anchorage. We now enter the forest region, the country being one impenetrable forest, with small clearings here and there where the towns and villages are built. The trees are magnificent, the most noticeable being the cotton and mahogany.

As we follow the stream up the northern arm the water gets clearer and clearer, being covered with masses of lovely white lilies; the banks become higher, and are covered with exquisite foliage. You see here and there long high walls of beautiful ferns stretching from tree to tree. The banks on each side are covered with orchids, flowering trees, and shrubs of every kind. The air is simply alive with the most gorgeous butterflies. The river is now very narrow and "twisty," there being sharp turns every few hundred yards. There are several towns, or rather villages, on each bank, all being oil markets. About 30 miles from Sapele is Sapoba, where the river practically ends, i.e., as far as navigation goes. In November, 1891, I traced the stream still further by wending my way through the forest trees in a small canoe; and from what the natives told me reached a spot about 3 miles further on which was about an hour's walk from the actual source of this arm of the river. This they described as a large pool, in which the water bubbled up out of the ground; they declared no water ran into this pool. However, on my return to Benin next year I intend to test the accuracy of their statements. My Jakri guide was somewhat loth to conduct me to this pool, as the people about there apparently regard it with a certain

amount of superstitious awe. I am convinced that the river, both this arm and the *Ethiope*, does not come from the *Niger*. The water is so deliciously clear, more especially so above *Utamara*, on the *Ethiope*, where it is as clear as crystal. You can see the bottom quite distinctly, although the water is $2\frac{1}{2}$ fathoms deep at that place; the current is, moreover, very rapid. Presuming that the *Jamieson* branch rises in the pool, as described by the natives, I fancy it will eventually be found that the *Ethiope* rises in the high ground north-west of the *Niger*.

Returning to *Sapele*, let us now ascend the *Ethiope*. This branch is also very narrow, but hardly as tortuous as the *Jamieson*, at all events not until you reach *Ekú*; after that it becomes narrower, and could not well be more winding than it is, the current being much swifter than on the other branch. The forest scenery up this way is even more lovely than that already described. After reaching *Ekú*, where we anchor our launch in about 10 feet of crystal water, we get into a canoe and paddle up stream, reaching the *Sobo* plains about 9 miles further on. These plains were mentioned by Consul *Beecroft* in 1840, and were the furthest point reached by any white man in this direction prior to last year (1891). They extend as far as the eye can reach, there being no signs of either animal or human life. These plains are covered with long grass, the soil being sandy, clumps of trees dotted here and there—an ideal spot for big game, though we saw none. Another 9 miles or so brings us to *Demovia*, in the *Abrakar-Sobo* country, the stream in some of the narrowest places nearly approaching to a torrent. From here we went 5 or 6 miles inland to a place called *Abrakar*, passing through many well-kept farms, chiefly pepper plantations, on the way. This was the furthest point reached by me in May 1892. When once clear of the mangrove swamps of the coast the soil is almost entirely red clay. There are no roads, the only substitutes being tracks through the forest, on which you have to walk in single file. Nearly all communication is carried on by means of the waterways. Beasts of burden of any kind are unknown, all carrying being done by the people.

As I remarked before, the climate of this region is very unhealthy, though its effect on Europeans depends a great deal on how they live. The temperature is equable, ranging from 92° to 70° in the house. The characteristics are those of West Africa generally, and it is unnecessary to repeat the details. As regards sport, you could not go to a worse place. There are plenty of bush-deer, a species of antelope; but they are very hard to get at, the bush being so very thick. Crocodiles abound, but you soon get tired of shooting them. The only really good shooting to be got is curlew. I never came across any hippo in the river, though I did nearer the *Niger*. There must be plenty of elephants in the *Benin* country, judging by the tremendous stores of ivory in possession of the king of that land. Monkeys swarm in the forests, but they hardly come under the head of game!

Let me now refer briefly to the tribes that people this part of the world. First we come to the Jakris, who are connected in race and language with the Yoruba people, extending from the Mahin country on the west to the Forcados on the east, and inland about as far as Sapele. The last king of the Jakris died in 1848, after which, and until recently, the people appointed a governor, whose powers were very limited, and the state of the river became one of anarchy. The Jakris act as middlemen in the trade between the white traders and the oil producers. They are a very timid race, and have very little idea of fighting. Domestic slavery is in existence, most of the slaves being bought from the neighbouring Sobo tribe. The value of a full-grown man is about £10. The Jakris are free men, and do no work. All their towns are built in the bush, the trees acting as a sort of natural screen in case of attack. The people are pagans. Their customs are barbarous; but now that the country is under British rule these things will disappear in time. There are several Ijo settlements in the Jakri country. The Ijos are a much-abused race, and were once inveterate cannibals; even now they do not object to a tender morsel of human flesh when the opportunity offers. Domestic slavery as it exists in the Jakri country has many points in its favour. There is really very little difference between the lot of a good slave and a freeman, except that the former works while the latter does not. They are housed and fed by their masters, and are given positions of trust, and in many cases they rise to be masters themselves, as in the case of the late King Ja-Ja of Opobo, who was originally a slave. Some of the Jakri chiefs display a very fair show of wealth, which usually takes the form of silks, coral, gold and silver ornaments, all specially ordered for them by the white traders. I have seen Nanna with seven or eight hundred pounds worth of coral on him.

The next tribe we come to is the Sobo, inhabiting the country on the left bank of the Ethiope River. They are a very timid race, given to agriculture, their chief occupation being the manufacture of palm oil. They recognise no common head, the country being divided among a number of chiefs, who are always quarrelling among themselves. Like the Jakris, these people are pagans; they do not keep slaves, but are bought as such by the Benin and Jakri people.

Next come the Benin people, the regular inhabitants of the vast Benin kingdom. It is difficult to say exactly how far this kingdom extends, and I should doubt if the king himself knows. About forty years ago it was supposed that he claimed territory up to within 50 miles of Lokoja, at the confluence of the Niger and Benue Rivers. The River Ethiope is probably the south-eastern boundary of this kingdom. Many states pay tribute to the king. The tribute is collected yearly, the king sending his so-called war-men to collect it. The inhabitants are somewhat superior to the neighbouring coast tribes, but

can hardly be called a brave people. They are given to agriculture, and are great hunters. Judging from the king's stock of ivory, the country must abound in elephants. When an elephant is killed the king claims one tusk, the other going to the hunter; but the king has the option of buying it if he wishes to. Christianity has never yet reached this country, although tradition says that the king of Great Benin city some time in the fifteenth century offered, for the small consideration of a white wife, to drive all his subjects into the pale of the church.

Before bringing this paper to a close, I will give you a short account of a visit to Benin city, the capital of the country, and the seat of government. I had the good fortune to be sent on a mission there last March (1892), the object being to conclude a treaty with the king, which object was fortunately successful, and the extensive dominions of the King of Benin are now under Her Majesty's protection. Very few Englishmen have ever visited the city of Benin. Prior to 1890 it would appear that only about three of our countrymen had been there. From all accounts the manners and customs of the people have changed very little since the days of Nyendale, in 1702. I was accompanied by Mr. Haly Hutton, Dr. Hanley, and Mr. Swainson.

We left the Vice-Consulate, near the mouth of the river, in a launch. Five hours' steaming brought us to Gwato. It was here that the great Belzoni, of Egyptian fame, died in 1823. There is, however, no trace of his last resting-place. Gwato was a large town once, but has suffered considerably during the frequent wars of past years. It is now only a small village, and it is here that the Benin people bring their oil and other produce to the white trader, there being two factories at this place. At present Gwato is the only place that the king will allow white men to land at with a view to visiting Benin city, all other routes being placed under fetish veto. However, it is to be hoped that before long all such foolish ideas will be dispelled. On our arrival at Gwato messengers were quickly despatched to the king to acquaint him of our coming.

Benin city lies about 25 miles from Gwato, the whole route being through a dense forest, with the exception of the last mile or two. We slept at Gwato that night, and started early next morning on our march, halting at a place called Egoru for the night, having done 16 miles of the journey. Just before reaching the city we had to pass through rather an unpleasant half mile of fairly open country. We presumed it was the place where all criminals' bodies were deposited. The path was strewn on both sides with dead bodies in every stage of decomposition; skulls grinned at you from every direction—a gruesome experience in its way. On reaching the city we found the king had told off a couple of very decent houses for our use. One we took possession of, and put our carriers in the other. These houses were built of red clay, having a high wall all round forming a sort of courtyard. There were two

fair rooms, and many uncanny alcoves; skulls, human and otherwise, hung around promiscuously. The walls were adorned with the impressions of a very large hand in lime and blood. The roof was a thatched one, full of creeping things.

I will not weary you with an account of our five days' stay in this extraordinary place. The king had promised to see me on my arrival, but it was three days before he gave me an audience. However, the result was very satisfactory, so one cannot complain. Benin city is the seat of a very powerful theocracy of fetish priests. The king is all-powerful, though he would appear to be somewhat in the hands of his big men, and very much tied down by fetish customs. He only goes amongst his people once a year, the occasion being one of general rejoicing and feasting. Human sacrifices are of frequent occurrence, and the rule is one of terror. The usual form of sacrifice is crucifixion. We saw several crucified victims during our stay in Benin city, on the plain outside the king's residence. It is, however, to be hoped that now this country is under Her Majesty's protection these terrible practices will be put an end to, though it must take time. Punitive measures are all very well in their way, but in a country like Benin the effect would probably be to drive the natives into the bush, and make them greater savages than ever; one cannot reasonably hope to abolish in a short time customs that have been in practice for centuries. The Benin people are free, but are treated as slaves by the king, the title of king's slave being considered an honour.

A man may take unto himself as many wives as he likes. To describe the manners and customs of this strange people would fill a book, but I must say, after all we had heard, we were disappointed in the place. If Dapper and Barbot are to be believed, verily and indeed the glory has departed from Benin city. However, one cannot very well expect to see prosperity going hand in hand with human sacrifices and other barbarous customs. It is almost impossible to conceive that such a deplorable state of affairs should exist in these civilised days, but I assure you I have not told half the horrors I saw and learnt about in the few days spent in that city of skulls.

It might prove interesting to compare the Benin city of to-day with what it was two or three hundred years ago. The Portuguese called it Great Benin. Among the Benin people it is known as Ado, meaning the place where the king lives, whilst the Jakris call it Ubini. According to Dapper the city was surrounded by a high wall, and contained many towers and spires. Nyendale, a Dutchman, would appear to be the best authority on the subject in the seventeenth and eighteenth centuries, he having visited the city on two occasions. He describes the streets as being "prodigious long and broad," and says that the town is "four miles large."

The state of the place to-day is very different, the so-called city
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being but a straggling collection of houses, built in clusters here and there, in little or no order. The number of ruins testify to the fact that it was once very much larger; but in our wanderings through the place we saw nothing that suggested "prodigious long and broad streets." The only market-place we saw was on the plain outside the king's residence. The whole aspect seemed to bespeak anything but a prosperous state of affairs. The principal part of the city is the king's residence. This consists of a number of compounds, each surrounded by a high mud wall. In each compound is a fetish shrine, composed of numbers of elephants' tusks, some very beautifully carved, together with a collection of native brass-work, the whole freely besprinkled with blood. After passing through several of these compounds you come to the king's houses, built of red clay, and with nothing particular to recommend them.

In each of the compounds are a number of king's stewards, a brass anklet, and sometimes not even that, being the sum total of their wardrobe. Very few of these functionaries have access to the king's presence, the penalty for passing beyond their own particular compound being death. The king keeps up a good deal of state, only a chosen few being permitted to speak to him direct. He is a very busy personage, attending to all state matters himself. The city is not fortified in any way, the only defence against attack being the natural screen afforded by the impenetrable forest.

The Benin people at one time had the reputation of being great weavers of cloth and workers in metals. They undoubtedly practise these industries now, though we saw nothing of the kind going on during our few days in the place. We saw, however, many specimens of brass ware of very clever workmanship.

In a woodcut in Dapper's work the city is depicted as having hills in the background. These hills certainly do not exist now. The same writer gives the king an army of 100,000 men, including many horse-men. To-day the king has no regular army, only a rabble called his war-men; and a horse is not to be seen in the country. In fact, horses are not to be found, according to native testimony, until one is three or four days' march on the other side of Benin city.

As I said before, the manners and customs of the people have apparently changed very little in the last few hundred years, human sacrifices, criminal law, no marriage customs, fetish belief, and general mode of living being to-day as they were in the days of Dapper and Barbot.

I feel I have already somewhat tried your patience, so I will conclude by asking you to overlook the many shortcomings in this my maiden effort.

After the reading of the paper the thanks of the meeting were conveyed to Captain Galloway by the President.

THE CROSSING OF THE HISPAS PASS.

By W. M. CONWAY.*

ASKOLE, BALUCHISTAN, KASHMIR.

July 29th, 1892.

TRAVELLERS in the northern regions of the kingdom of Kashmir, who paid attention to the higher mountain districts, reported traditions of the former existence of various ancient passes across the great ridges. These passes are always stated to have been freely used in days more or less remote, but to have been abandoned and become forgotten in recent years, either through insecurity of the roads from raiders, or, in most cases, owing to a reputed change in the condition of the glaciers and an increased accumulation of snow at high elevations. Anyone acquainted with the history of mountaineering will at once perceive a strong analogy between these reports and the statements made to travellers in Switzerland when the real exploration of the Alps began. It was, for instance, reported at Zermatt, in the fifties, that there was in former days a pass over what is known as the Weissthorn ridge, which the natives used to cross when they went on pilgrimage to sacred places within what is now the Italian frontier. This old Weissthorn pass was stated to have become impassable owing to an accumulation of snow at the top, and it was therefore abandoned. Other old passes shared the same fate, but all were sooner or later rediscovered by the modern generation of mountaineers. The passes across the Hindu Kush and Karakoram ranges will all, no doubt, sooner or later, reveal themselves to properly trained European climbers, and I am happy to be able now to describe the successful passage of two of them.

Native tradition preserved the memory of at least four traversable routes across the main chain of mountains between Rakipushi (near Gilgit) in the west and the Karakoram Pass in the east. There was first the Nushik La, which led from Hispar to Arundu and so to Skardu; second, the Hispar Pass, or Rdzong (meaning "fortress"), from Hispar to Askole; third, the Mustagh Pass from Yarkand to Askole; fourth, the Salto Pass from Khapalu to Yarkand. Unsuccessful attempts to cross the first and second of these have been made by Englishmen at different times. Captain Younghusband rediscovered and successfully crossed one of the two Mustagh Passes in 1887, the other of which had been visited, as well as the Nushik La (though not crossed), by that admirable traveller and surveyor Colonel Godwin Austen in 1861. The approaches to the Salto Pass have been investi-

* This letter was posted at Skardu on August 9th, 1892, but was not delivered in London till the last days of December.

gated by Lieutenant Molony, R.A., but the pass itself has not been visited.

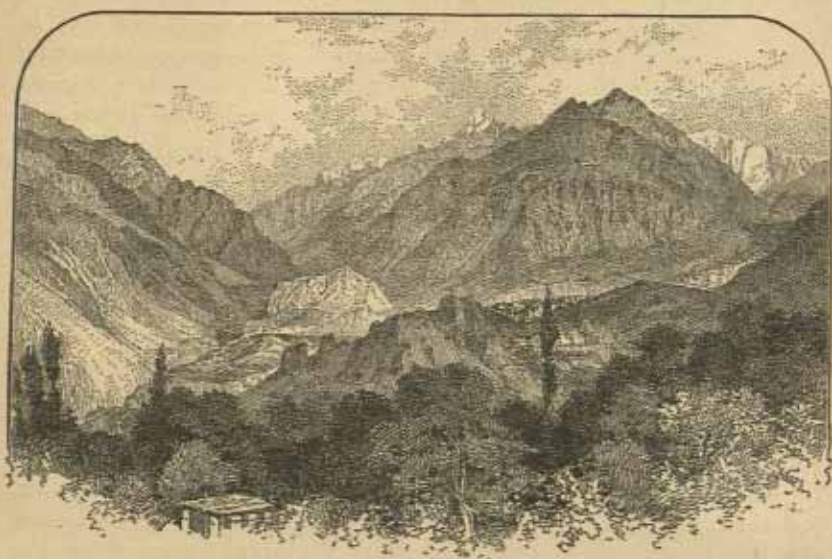
The party which I have the honour to lead, consisting of the Hon. C. G. Bruce (5th Goorkhas), Mr. A. D. McCormick, Mr. J. H. Rondebush, Mr. Eckenstein, and the Alpine guide M. Zurbriggen, having passed through Gilgit and up the Hunza-Nagyr valley, left Nagyr on June 27th to cross the Nushik La and the Rdzong or Hispar Pass. Two miles above Nagyr we came to the foot of the Hopar Glacier and ascended beside it for about 5 miles to a wonderful basin of cultivated fields and rich meadows, in which the five villages of Hopar are situated, enclosed on one side by the glacier and on the other by snowy mountains. Here we found a grand system of glaciers, unmarked on any map, ramifying from the south in all directions, and flowing down from a number of peaks of 20,000 to 24,000 feet in height. I remained eight days in this district for the purpose of making a thorough exploration and map of the glaciers, but as there was great dearth of provisions, I was obliged to send on Messrs Bruce and Eckenstein with two Goorkhas and coolies to cross the Nushik La at once and bring up supplies to meet us on the other side.

Whilst in the Hopar district I attempted the ascent of a peak of 21,500 feet, but after mounting the glacier towards it for 17 miles we found ourselves cut off from the final easy slopes by about 100 yards of impassable ice-fall—a chaos of loose blocks of ice that insecurely covered a series of deep and broad crevasses. Zurbriggen and two Goorkhas worked for hours to force a passage through this place, but had to give up the attempt. We were therefore forced to return and content ourselves with climbing a difficult rock peak of only 17,000 feet, from which however we enjoyed a gorgeous panorama.

We now crossed to the right or north bank of the Hopar Glacier, and then, passing over a ridge about 16,000 feet high, we descended into the Hispar Valley on the other side. We might have mounted the Hispar Valley directly from Nagyr, but it is an absolutely desert trough of rocks, sand, and stones. The *détour* by Hopar is really the quicker route. From the point where we struck the bank of the Hispar stream to Hispar was a distance of about 16 miles; and this was the most horrible piece of walking we had any of us ever experienced. The sun blazed overhead; the thermometer stood at 90° Fahr. in the shade; the bare rocks on either hand concentrated the heat upon us; and the going for most of the way was either wading in sand or striding from one pointed and broken rock to another. The flies made life burdensome, and there was nothing but the muddiest water to drink. As we approached Hispar we had to cross the foot of a steep side valley, whose stream drained some hidden snowy area high above. Just as we reached the brink of the gully we heard a sound like thunder, and saw, advancing downwards at a great rate, a huge black volume of mingled

mud, water, and rocks, which filled the whole gully, and was making for the river below. The rocks that formed the vanguard of this hideous thing were many of them as large as 10-foot cubes, and they were rolled round and round by the mud as though they had been pebbles. In half-an-hour this mud-avalanche was completely passed, and we were essaying to cross the stream, when a second and larger one hove in sight above, and we had to hurry back to escape it. Three times did the mountains disgorge these black monstrosities upon us before we were able to seize a favourable moment to cross the gully that barred our advance.

We spent two days at Hispar, and on one of them I ascended a hill south of the village to try and gain a view towards the great



FOOT OF THE HISPAR GLACIER.

pass. After mounting about 3000 feet I turned a corner by a great stone-man, and was astonished by the view that opened before me. The whole upper stretch of the Hispar Valley was displayed, stretching for some 40 miles, without bend or fold or jutting headland, to the pass at the top, and entirely filled with one vast, even, gently-inclined glacier. The lowest 20 miles of ice were entirely covered with a mantle of moraine. An avenue of mighty peaks walled the glacier in on either hand, and a sombre roof of cloud, at a height of about 22,000 feet, lay motionless over all. The glacier began about a mile above the green fields of Hispar, and beyond that point there was not a visible trace of the presence or activity of man. It was a sight to stimulate any explorer, and I immediately descended with my Goorkha companion,

and made all arrangements to start for the pass on the following morning (July 11th).

What with the badness of the stony way, the unwillingness of the coolies, and the many necessary halts for surveying and collecting, our first three marches up the glacier were short. The same distance was accomplished by our lightlier burdened and hungrier predecessors, Messrs. Bruce and Eckenstein, in two days. We thus reached an Alp and camping ground, called Haigutum, on the left bank of the glacier, and something less than half-way up it towards the pass at the glacier's head. Haigutum is an important point on the route, for here a short side glacier (the Haigutum Gamu or glacier) joins the main stream from the south. At the head of the Haigutum glacier is the Nushik La; at the head of the main glacier is the Hispar Pass. It was my intention on the following day to have ascended to the top of the Nushik La, but, as clouds enveloped the glacier and snow fell with much persistence, the expedition would have been valueless. Let me, therefore, briefly describe the adventures of my companions in the passage of this pass.

Messrs. Bruce and Eckenstein, with their followers, after having been stopped at Haigutum for two days by a snowstorm that lasted forty hours, started on July 4th to cross the Nushik La. Their party consisted of fifteen men and a dog; amongst the men was one Shersi of Hispar, who said he had crossed the pass in his youth. I now quote from Mr. Eckenstein's diary:—

"We started at 4.15 A.M. in beautifully clear weather. The way went first along the top of the old moraine (on the end of which Haigutum is situated) and then down to the Haigutum glacier, which is reached in ten minutes. This is crossed diagonally in half an hour to the foot of the slope opposite (*i.e.* the north-west slope of the mountain east of the pass), which is struck at a point considerably to the left of and below the pass, the part below the pass being steep and raked by avalanches. From here to the top of the pass took four hours and a half. The whole way up is on steep snow-slopes, cut up by many *schrunds*, and it is impossible to go without traversing some places where there is danger from falling ice. The slope is of a considerable average steepness, the bit which was steepest (about 150 feet high) being at an angle of $52\frac{1}{2}^{\circ}$. Bruce, the two Goorkhas and old Shersi went roped together in front, and I brought up the rear. The dog acted like a true mountaineer. When the slope got too steep for him to run about on, he gave up frolicking around, and followed soberly and properly in the steps. At the beginning the snow was somewhat soft, and for a short time unpleasantly so. Our progress was regular and uneventful for rather more than half-way up. The place we then got to presented two alternatives; either to go over a *schrund* *via* a very shady snow-bridge, which would have been followed by a fair snow-slope; or to avoid the

schrund by going to the right. This was very much the more direct way, but involved going up the steep slope mentioned above, and a slip on this would certainly have been fatal, as it terminated in an ice-precipice below. The slope was ice underneath, covered by about a foot of not over-good snow. I abstained from saying anything, and asked Bruce to let the natives settle it between themselves, and their subsequent performance proved full of interest. Two of them put down their loads and took off the goat-hair rope they use for carrying. They took a double length of this, and one tied it round his waist in true orthodox style. They then borrowed one of our axes (which so far had not been used). The first man (who was tied round the waist) started ahead with the axe, cutting steps, followed by the second man, who held the two ends of the doubled rope tied round his stick, which he drove in as he went along. And so they went along till the easier slope above was reached. Then the others followed, and subsequently three went back to bring up the two loads that had been left behind. It was really a capital performance, and would have done credit to any men. Altogether their performance, and that of the other five natives as well, was one that not every Swiss guide would care to imitate under similar conditions. None of the loads were much above 30 lbs., but were all arranged to be inside this limit as far as possible. Just below the top of the pass there was a rather nasty piece of slope, with snow that was very rotten. Our natives all stopped, and each said his prayers before going on to it. The top was all corniced, and we did not go over quite the lowest point of the pass, but at a point about 50 feet higher to the east. Amar Sing and Parbir (the two Goorkhas) cut through the cornice, the passage of which required the use of the rope in the case of every member of the party. We reached the top at 9.40 a.m., and the view from there is truly splendid."

The descent to Arundu is perfectly easy and straightforward, and does not need description, for it has been admirably described by Colonel Godwin-Austen in the *Journal* of the Royal Geographical Society for 1864.

When we reached Haightum we had still a certain amount of baggage and some servants that could be dispensed with, so we arranged to send the whole over the Nushik La to Skardu, in charge of Mr. Roudebush. Zurbriggen was to accompany the party for two marches, and then return and join me again on the Hispar glacier. The party under the command of Mr. Roudebush crossed the pass in bad weather on July 14th. They also had a local guide with them, but neither guide nor coolies showed the least mountaineering ability. At first they took the same route as Mr. Bruce, to the far side of the Haightum glacier; but then Zurbriggen declined to follow the local guide, who, like Shersi, was for leading them under some dangerous overhanging ice, which might have fallen upon them at any moment. Zurbriggen struck out a

safe route more to the left and reached the watershed, in three hours and a quarter of actual climbing, at a point about half a mile east and 500 feet or more higher than the point where Mr. Bruce's party crossed. He had infinite trouble with the coolies, who kept on throwing down their loads and refusing to advance. Again and again he had to go down and help the men up, one by one, which he did with the greatest kindness. The coolies fully realised the value of his help, and when all the difficulties were over, they fell on the ground and kissed his feet, saying that thenceforward they would follow wherever he chose to lead. One of these men returned with Zurbriggen to my party, and his account of what had happened stimulated the courage of my coolies, who thenceforward ceased to give trouble and worked admirably and without complaint.

Zurbriggen was away from me for three days in all. During one of these days we remained stationary. On the other two we made long marches up the glacier, the surface of which was now free from stones, except for two or three big medial moraines. Our advance was by no means easy, for the glacier was often crevassed and always cut up by large sinuous streams, far too wide to be jumped, which undercut one side of their bed. We had to meander around the curves of these waters, often finding it difficult to discover a route. On the evening of July 16th we encamped at the edge of the upper snow-field, and at the angle of a great icy affluent, flowing in from the south, at whose head stood a mighty white mountain, so graceful in form, and pure in aspect, that I named it the White Lily. Shortly after camp was pitched we heard Zurbriggen's whistle coming from far over the glacier, and in due time he arrived from his laborious march.

The next day Zurbriggen rested, and we took rounds of angles with the theodolite, catalogued collections, inked in the map, and engaged in other needful occupations. On July 18th we started, meaning to make a camp at the foot of the final ascent of the pass. The coolies, led by a Goorkha, went up the right side of the glacier; M'Cormick, Zurbriggen, and I, with the other Goorkha, struck straight across the ice to the other side, in order to reach certain points necessary for the survey. As we went along we found the snow to be in admirable condition; the day was so superbly fine that we loudly bewailed our failure to arrange for pushing on at once over the pass. Just then we saw that the crevasses at the foot of a side glacier were forcing the coolies out into the middle of the ice and within shouting distance of us. In a moment I determined to change our plans, and signalled for all the men to come in our direction. We started at once up the long snow slopes towards the col, and walked at a rapid pace. Zurbriggen led skilfully through a labyrinth of great crevasses that presently intervened, and then we had to pound over some 4 miles of gently sloping snow-field to the pass. At noon we were all united on

the summit, and the longed-for view over the other side disclosed itself to us.

It is a view unique in my experience of mountains. We saw no series of ridges, and looked down no long glacier such as we had expected to behold. Instead of these things there was displayed beneath us a vast, seemingly flat lake of snow, in area at least 300 square miles, white, silent, the very embodiment of stillness and calm. A great range of peaks ringed it around, and a mighty group of rock-needles jutted into the heavens on one side of it to a height of 24,000 feet; masses of rock surpassing the Aiguilles of Chamonix in number, in steepness, and immeasurably in size. There was no visible outlet to this lake, but there was a suggestion of the existence of one round the corner to the right, hidden by a near snowy ridge. We feared that there would prove to be a great ice-fall at this point, and the reported "accumulation of snow" might well enough have resulted in making an ice-fall, of such dimensions as this would necessarily possess, wholly impassable. We stopped for an hour and a quarter on the pass, during which time we lunched. I took a round of angles and read the instruments. The mercury stood at 15.85 inches. The air temperature was 64°. Many of us felt, though none suffered from, the diminished atmospheric pressure, but the burning heat of the sun in the morning gave us headaches, which the diminished pressure may have increased. The headache, however, was primarily one of the sun-headaches with which we have become far too familiar.

It was not without some misgiving that I gave the word to descend. We went down a gentle snow-slope, and then through a maze of big crevasses, thus reaching the edge of a bay of the great snow-lake. We traversed this and passed round its far angle to the right. There, as we turned the corner, the broad smooth highway of the Biafo glacier opened suddenly before us, stretching away far as the eye could reach, without visible crease or chasm in the direction we must go. On either hand peaks of extraordinary abruptness, to which the mountains of Europe contain no parallel, rose one behind another in interminable array. Far in the distance clouds and glacier seemed to meet in purple indistinctness. Just round this corner, for us so momentous, we found a plateau suitable for the camp; there we spent the night. Hour after hour snow fell deep upon us, and the clouds wrapped us around, but in the morning the weather lifted somewhat, and we were able to continue our way. We marched about 12 miles before camping at nightfall in the bed of an old lake.

The glacier was without crevasses for the whole distance, a most disagreeable condition of things, for there was no crack for the melted snow to flow into, and it lay about all over the surface of the ice and turned it into slush. We waded for hours through this nameless compound of water, ice, and snow, which sometimes reached to the

knee. Imagination cannot picture a greater satisfaction than we felt when we once more trod on earth that was partially dry. The next day we made another long march, and came in the evening to a reasonably comfortable level, where there was brushwood to burn and grass to lie upon. On the following morning I sent off Zurbriggen and the spare coolies to Askole, about 25 miles down. They reached the village in the evening by a long forced march. M'Cormick and I remained all day resting in camp, and spent the day following in sketching and surveying. The weather now became steadily bad, and my survey could proceed but slowly, owing to the constant clouding of the peaks and their intricacies of form. We were thus unable to reach Askole with a finished map till four more days had passed; but ultimately all our work was satisfactorily done, and on July 26th our whole party (with the exception of Mr. Roudebush, who remained at Skardu) was reunited at Askole.

The Hispar Pass is thus from the end of the Hispar Glacier to the end of the Biafo Glacier over 80 miles in length, and is the longest glacier pass in the world outside of the Arctic regions. At Nagyr everyone declared that it had not been crossed in the memory of any living person, and it was evident enough that none of the men that accompanied us had the least knowledge of the way, for they were all as surprised as we were at the unexpected nature of the view from the col. At Askole, however, I was able to learn some more precise traditions from the mouths of the Baltis. Colonel Godwin-Austen, writing in 1864, says of the Hispar Pass, "It was by this way that the Nagyr men used to come into the Braldoh and loot the villages; their last raid was some twenty-four years since (*i.e.* about 1840), when a body of from seven hundred to eight hundred crossed over, and carried off about one hundred men and women, together with all the cows, sheep, and goats, they could collect." I enquired about this story every day I was in Askole and was informed as follows:—The last time there is any memory of the pass having been crossed was in the days of the father of the very old man in whose house our baggage was stowed. He does not remember the event, but he remembers his father telling him about it. The leader of the band that crossed from Nagyr was Wazir Hollo. They came late in the year, three months later than now. The harvest in Nagyr had been bad and the Nagyr folk needed provisions. The band did not attempt to attack Askole, said the old man, but the Baltis gave them ibex skins and flour. The Nagyr people invited some of the Baltis to go back with them, but they refused, fearing the cold. The Nagyr men started to return by the way they had come, but they all perished in the snow except Wazir Hollo, who alone reached home to tell the tale. There is perhaps a fragment or two of truth in this story, but the actual facts will probably never be discovered.

MENDEZ PINTO.

By STEPHEN WHEELER.

MISTRESS DOROTHY OSBORNE found entertainment in the travels of Ferdinand Mendez Pinto—" 'tis as diverting a book of the kind," she tells Sir William Temple, "as ever I read;" but more serious critics must often have been tempted to throw aside his narrative in despair. Dates and names of places appear to have been scattered about the pages at haphazard. Small wonder that Cervantes called him a liar. Moreover, Mendez Pinto writes himself down a blustering rogue and cut-throat in prosperity, a poltroon when the odds were against him. We get a clear indication of his character in the account given of his visit to Kwedda, a small state in the Malay peninsula. He had sailed thither in company with a Mohamedan factor. This unfortunate man, at a feast to which he was bidden by a brother Moslem, spoke ill of the Raja, who, on hearing of it, ordered both host and guest to be seized and put to death. Their hands, feet, and lastly their heads were sawn off. Mendez Pinto was in an agony of terror. "Like one distraught of my wits," he says, "I cast myself at the feet of the elephant whereupon the king rode, and with tears in my eyes cried out, 'O sir, have pity on me, and take me for thy slave rather than cause me to end my days with the torments which have taken those out of the world whom I see here.'" He asserted that he was nephew to Dom Petro de Faria, which was a lie; and furthermore, by way of propitiating the king, vowed that Dom Petro would be vastly pleased at the execution of the factor, a dog who had embezzled the goods committed to his charge. This was another lie, invented, says Pinto, upon the sudden, "and not knowing well what I said."

Evil deeds were wrought by the adventurers in whose service Mendez Pinto sailed the Eastern seas. Antonio de Faria, perhaps the ablest of his commanders, was great at surprises; at taking the enemy—that is, anyone weaker than himself—unawares. We read of his boarding a junk and flinging four pots of gunpowder among the rascals asleep upon the hatches, which made them all leap into the sea. Nine or ten were drowned, but the others were rescued and pressed for sailors. We read again of the vanquished dying in torments like mad dogs. Even little boys and old men were tortured. Captives were put to death "by making their brains flye out of their heads with a cord." When the Portuguese sacked and burnt the town of Nouday, in Southern China, it was great pity, says Pinto, to behold a number of handsome maids led away, tied four and five together, weeping and lamenting. When they treacherously laid hands on a bride who had come to De Faria's ship, believing that her newly-married husband was on board, Pinto only recollects the humorous side of the incident. His account of the burning of a village in the Island of Hainan may also be quoted.

One house was filled with sick and wounded. The poor creatures begged for mercy; but Antonio de Faria would by no means hearken unto them. "It would have moved any man to pity," Pinto declares, "to hear the lamentable cries made by the wretches within, and to see them cast themselves headlong out of the windows, where our men received them upon their pikes and halberds."

Ferdinand Mendez Pinto sailed for the Indies in March, 1537, "meanly accommodated," but thinking it the best way to free himself from his poverty. He had recently been in the household of a Portuguese grandee, waiting on him in his chamber, so we may infer that he embarked in some subordinate capacity, either as a body-servant or a soldier. But as Tavernier tells us, every Portuguese became a *hidalgo* directly he passed the Cape of Good Hope. Plain Jeronimos and Pedros straightway prefixed "Dom" to their names; and, according to the Baron, common soldiers stood as fair a chance of becoming wealthy as governors. From the time of his arrival at Din till he returned to Lisbon some twenty years afterwards, Pinto's life was a series of adventures by sea and land, each more exciting than the last. When his ship reached Din, the Portuguese garrison were expecting to be attacked by a fleet from Egypt, equipped by the Pasha of Grand Cairo, in obedience to orders from the Sultan of Constantinople, to whom the Sultan of Gujarat had appealed for help against the Europeans. Pinto now went with a couple of small ships which sailed for the Red Sea to get intelligence as to the Pasha's designs and preparations. From Massowa he was sent inland with a party taking letters to a Portuguese agent at the court of the King of Abyssinia. He thus traversed "the Empire of Negus to his utmost port Ercoco,"* or as Pinto spells it, Arquico. On the way back he was wrecked near Aden and taken prisoner by the Arabs. They sold him as a slave; but he was lucky enough to fall into the hands of a Jew who, for a consideration, handed him over to the Portuguese at Ormuz, whence he found his way to Goa.

Pinto next took service under the Captain-elect of Malacca, with whom he sailed for Further India. From Malacca he was sent on a political mission to Sumatra, and having discharged this duty to the satisfaction of the Captain, was afterwards employed on a similar mission to some petty rajahs on the eastern coast of the Malayan Peninsula. He next fell in with Antonio de Faria, half trader, half pirate, under whom he sailed to Siam, Tonkin, and China.

The kind of enterprise Mendez Pinto was now engaged in has already been described. At Liampo, the modern Ningpo, where the Portuguese had a settlement, Antonio de Faria was received with every possible demonstration of respect. The adventurers attended mass at the church and listened to a sermon in praise of Antonio de Faria, "but

* 'Paradise Lost,' xi. 397.

that in words so ill-placed and so far from the text that our Captain was much ashamed at it." A fastidious and dogmatical pirate. Then came a banquet at the town-hall, where De Faria was served by eight maidens, exceeding fair and comely, and attired like mermaids. These young ladies were the daughters of worthy merchants who wished to do him honour. The festivities ended with a bull-fight.

It was at Liampo that De Faria first heard of the island of Calempuy. A Chinese pilot told him that in this island were buried, in tombs or coffins of gold, seventeen Kings of China; that here also might be found a vast number of golden idols and such other immense treasures, Pinto writes, "as I dare not deliver for fear of not being credited." Being inquisitive by nature and withal ambitious, De Faria resolved to set out for the island of Calempuy without delay. Geographers have still to ascertain the latitude and longitude of Calempuy. Here is an extract from Pinto's description of the place:—

"This Island was all inclosed with a platform of Jasper, six and twenty spans high, the stones whereof were so neatly wrought, and joyned together, that the wall seemed to be all of one piece, at which everyone greatly marvelled, as having never seen anything till then, either in the *Indies*, or elsewhere, that merited comparison with it; this Wall was six and twenty spans deep from the bottom of the Iliver to the Superficies of the water, so that the full height of it was two and fifty spans. Furthermore the top of the Platform was bordered with the same stone, cut into great Tower-work; upon this wall, which environed the whole Island, was a Gallery of Ballisters of turned Copper, that from six to six fathom joyned to certain Pillars of the same Metal, upon each of the which was the figure of a Woman holding a bowl in her hand; within this gallery were divers Monsters cast in metal, standing all in a row, which holding one another by the hand in manner of a dance incompassed the whole Island, being, as I have said, a league about."

A writer in the *Encyclopædia Britannica* states that Calempuy was near Pekin. I should be inclined to search for the island up the Yang-tse; or it may be P'u-to, east of Chusan, a famous place of pilgrimage, dedicated by the Buddhists to Kwan-shi-yin. But, wherever it was, the Portuguese found their way there and proceeded to rifle the royal tombs. The work of plunder, however, had only just begun when the guardians of the temple gave the alarm, and the baffled Portuguese had to fly for their lives, Antonio de Faria "tearing his hair and beard for very rage, to see that through his negligence and indiscretion he had lost the fairest occasion that ever he should be able to meet withal."

Shortly after this adventure, Pinto was once again shipwrecked; and we now come to the most striking episode in his reminiscences. For after divers mishaps, he and some twelve or more of his band were seized by the Chinese and taken to Nankin, whence they were presently sent first to Pekin—Milton's 'Paquin of Sinaean Kings'—and afterwards to Quinsay, not the noble city of that name described by Marco Polo, but some town, apparently, nearer to the northern capital. At this time, that

is to say about the middle of the sixteenth century, the dynasty founded by the Mings, who some years earlier had expelled the feeble descendants of Khublai Khan,¹ was now itself threatened by approaching dissolution. Within the next fifty years it was to be displaced by the Manchus; but in Pinto's day the chief danger was from another quarter. At the end of the fifteenth century, Dayan Khan, descended from Khublai and Jenghis Khan, had once more united the Mongol nation. For upwards of fifty years he seems to have possessed supreme authority. On his death, however, the Mongols again became divided, various sections being ruled by one or other of his sons and their descendants. Of these, Altan Khan, chief of the Tumeds, became famous. He was a grandson of Dayan Khan; and besides being chief of the Tumeds, he was virtually leader of a confederacy which included two other sections. His own tribe, the Tumeds, lived and still live near the great bend made by the Hoang-ho, or Yellow River; being adjacent to the country of the Ordus through which the Abbé Huc, and recently, the Russian explorer, M. Potanin, travelled. Most of Altan Khan's life was spent in wars with the Ming emperors of China. "Never," says Moyria de Maillae, "had the Tartars so much harassed the Chinese as under his leadership." He first attacked them in 1529, and invaded their country at intervals down to the year 1556. A full account of Altan Khan, and all that he did, will be found in Sir H. Howorth's 'History of the Mongols.' It was in Altan Khan's time, and mainly by his influence, that the Mongols were converted to Buddhism as it now prevails in Mongolia.

We know from history, that in the year 1544 Altan Khan entered the province of Pe-Cheli, and advanced almost to the gates of Peking, ravaging everywhere. In 1549 he suffered a reverse, but the next year again advanced to the capital. Whilst Pinto and his fellow-captives were at Quinsay—the date he himself gives is July 3rd, 1544—news came that the King of Tartary had fallen upon the city of Peking with 1,800,000 men, whereof 600,000 were horse, with 40,000 "rhinocerots" that drew the waggons wherein was the baggage of the army. For "rhinocerots" we must no doubt read "camels," and the strength of the Tartar king's army is assuredly exaggerated; but, unless Pinto's dates are altogether and hopelessly wrong, we may safely conclude that it is Altan Khan, chief of the Tumeds, of whom he is speaking. It could not possibly have been, as Professor Vambéry suggests, in an introduction to an abridged reprint of Pinto's 'Voyages,' Nurhachu, the Manchu chief, who was not born till some years afterwards. One division of the Tartar host presently laid siege to Quinsay, and battering down the gates with iron rams, carried the place by assault. "Thus did these barbarians possess themselves of this miserable town, whereof they put all the inhabitants they could meet withall to the sword, without sparing any; and it was said that the number of the slain amounted to

60,000 persons, amongst whom were many women, and maids of very great beauty, which appertained to the chiefest lords of the place."

Pinto and his companions were more fortunate. Their lives were spared and they were taken to the Tartar king's headquarters before Pekin. Here they were summoned to his presence. Altan Khan was "about forty years of age, full stature, somewhat lean, of good aspect; his beard was very short, his mustaches after the Turkish manner, his eyes like to the Chinese, and his countenance severe and majestic."

Unable to capture Pekin the Tartars retired, taking Pinto and his companions with them. Recrossing the Great Wall and embarking, apparently, on the Hoang-ho, they came first to Lancama and afterwards to Tuymican. Lancama is elsewhere referred to by Pinto as the city where "Tamberlain, king of the Tartarians," usually kept his court, but Timur,

"The mighty Tamurlane,
That was lord of all the land
Between Thrace and Samarcand."

flourished two hundred years earlier, and never came so far eastward. It must have been some other Timur who kept his court at Lancama. Altan Khan's capital, according to Pinto, was at Tuymican. Hither came ambassadors from six great and mighty monarchs, namely, Xataanas, the Sophy of Persia, the Emperor of the Yucos, whose country borders on that of Bramaa (Burma) and Tanguu (Tonghoo); the Calaminham, a more or less fabulous potentate, Sir Henry Yule says, in the interior of Indo-China; the Great Moghul; and the Emperor of Caran. Xataanas, the Sophy of Persia—Milton's 'Bactrian Sophy'—must be Shah Tamasp, the Suffavi King of Persia. Elsewhere Pinto says that he alone of all foreigners was allowed to buy the fine porcelain of Nankin. The Emperor of Caran is not so easy to identify. On the borders of his kingdom, Pinto tells us, there dwelt a people whom they of the country called Muscovites—"men of fair complexion, well-shapen, and apparelled with breeches, cassocks, and hats like to the Flemings which we see in Europe."

Altan Khan presently allowed the Portuguese to go away with an ambassador whom he was sending to the King of Cochin China. The description of the journey is most interesting. They had reached the country of the Tumed Mongols from Pekin, and were now to travel southwards through the borderlands of China and Tibet to the Gulf of Tonking. Marco Polo has described the journey from Pekin to Tibet; the Abbé Hue went this way to Lassa; Prejevalsky has explored the country round Kokonor; the route has been crossed by several travellers ascending the Yang-tse-Kiang; a French expedition ascending the Mekong reached Yunnan, and only lately M. Bonvalot and Prince Henri d'Orleans, reaching south-eastern Tibet from Lob Nor, have found their way, *via* Batang, Ta-tsien-lu, and Yunnan, to Tonkin.

The exact route followed by Pinto has never been traced. Starting from Tuymican, which was probably not very far from the lake Koko-Nor, he seems to have reached the upper waters of one of the great rivers which take their rise in the eastern plateau of Tibet, the Yangtse-kiang or the Mekong or the Salween. After descending the river for some distance, the travellers must have struck across the mountains to the valley of the Songkoi, the Red River of Tonkin. One of the first places they came to after leaving Tuymican was a fortified town which Pinto calls Puxanguim. The defences included "cannons of wood made like to the pumps of ships, behind which they put boxes of iron that held their charge and were fastened unto them with iron bands." The Portuguese asked who it was that had fashioned this primitive form of breech-loader, and were told that "certain men called Almains, and of a country named Muscovy" were the inventors. They had come thither in company with a widow lady of a place called Gaytor, who had been chased out of her country by a king of Denmark. This is a curious story. De Mendoza in his 'History of China,' published in 1585, observes that the Chinese had the use of artillery long before any European nation. "The first beginning," he goes on to say, "was in the yeare 1330 by the industrie of an Almane, . . . but the Chinos saie, and it is evidently seene, that this Almane dooth not deserve the name of the first inventor, but of the discoverer, for that they were the first inventors."

At a very fair town called Quanginau, the travellers halted three days, in order to see the festivities that were held to celebrate the entry of the Talapicor of Echuna, or Lechuna, as the name is elsewhere spelt, who was going unto the Tartar king "to comfort him about the ill-success he had had in China." The Talapicor, says Pinto, is their Pope; and one is tempted to believe that he may have been no other than an early incarnation of the hierarch now known as the Dalai Lama of Lassa. Sir Henry Howorth tells us that the third Dalai Lama visited Altan Khan in the year 1577. The Talapicor preached at the pagoda attached to a Lamaist nunnery at Quanginau, "delivering a world of extravagancies and fooleries," and Pinto actually gives us an extract from his sermon.

Fourteen days after leaving Quanginau, Pinto and his companions came to Lechuna itself, "the chiefest city of the religion of these Gentiles, and such it may be as Rome is amongst us." Here there was a very sumptuous temple wherein were the tombs of seven-and-twenty emperors of this monarchy of Tartary. A short distance from the temple was an enclosure containing two hundred and eighty monasteries, wherein were numerous pillars of brass surmounted by an idol of the same metal. "These idols are the statues of them whom in their false sect they hold for saints, and of whom they recount such fopperies as would make a man wonder to hear them." The word "Lechuna" may

be only the Tibetan *Lha-Khang*, a temple; but it seems quite possible that Pinto may have visited Lassa. Friar Odoric of Pordenone was there in the early part of the fourteenth century; and the Fathers Grueber and Dorville reached Lassa from Peking in 1661.

We now come to what from a geographical point of view is one of the most remarkable of Pinto's stories. He states that some time after leaving Lechuna he arrived at the lake of Singapamor, "an admirable masterpiece which Nature hath opened in the heart of this country." From Singapamor flowed four very deep and large rivers. Innumerable disquisitions have been written on the hydrography of Tibet. The following passage is from the account of M. Bonvalot's expedition—

"Nous avons atteint le sommet de l'ancien monde, c'est sous nos pieds que ses grands fleuves prennent leur source. Les glaciers que nous découvrons envoient leurs eaux d'un côté à l'Océan Indien, par la Salouen [our Salween] le Mékong, et de l'autre, aux mers de Chine par le Yang-tse. . . . Et lorsque nous découvrons ces lacs immenses, encore complètement inconnus, ou que nous baptisons ces chaînes colossales, il nous semble que nous violons quelque sanctuaire."

What seemed to Pinto Nature's admirable masterpiece is to the French traveller an inviolable sanctuary. The Salween is Pinto's "Jangumaa," which enters the sea by the bar of Martaban. Jangumaa is not a bad transliteration of Giana Nu, which is one of the names given by the Tibetans to the upper waters of the Salween. The Mekong or river of Cambodia is Pinto's Ventrau or Ventinau, which runs through Siam and enters the sea by the bar of Chiamba. Of the other rivers which, according to his theory flowed from Lake Singapamor, one he thinks might be the Ganges. As Sir Henry Yule observes, the idea of great rivers radiating from a central lake repeatedly occurs in the writings of the early travellers. In the 17th century, Father Henry Roth, who had been attached to the Jesuit mission in India, told Kirchen that, among the snowy mountains of Tibet, there was a vast lake from which the Ganges, the Indus, the Ravi and the Athek (? Attock or Kabul river) derived their sources.

When Pinto reached the country which he calls Cauchenchina, the king had recently gained a victory over the Tinocouhos. This must refer to the civil war between the ruler of Tonkin and the chief of Tenchoa or Tingiva. For the history of Tonkin during this period, we have the narrative of Christopher Borri, an Italian Jesuit, and 'A Description of Tonqueen,' by S. Baron, who, according to old records quoted by Sir Henry Yule, was born in the country, "his grandfather by the father's side a Scotchman, his father a Dutchman, and his mother of the race of Portugalls." The reference is necessary to show that Pinto reached the Gulf of Tonkin near the mouth of the Songkoi River.

Here his journey across Asia overland came to an end; and his subsequent adventures, including two voyages to Japan, must be left to

some other commentator. But even from this brief summary of his earlier wanderings, it may be seen that his book throws a curious light on the mediæval geography of Asia, and in particular helps us to understand how the Portuguese at one time seemed to "hold the gorgeous East in fee," and how, as an old geographer says, "their insufferable pride and insolence brought on their destruction." Their settlements at Goa and Macao alone remain to attest their former dominion in the Eastern seas.

THE RUINS IN MASHONALAND.*

By HENRY SCHLICHTER, Ph.D.

THE outlines of Mr. Bent's discoveries in Mashonaland have already appeared in last year's *Proceedings*, R.G.S. From Mauch's discovery of the great ruins of Zimbabwe in 1871, up to Bent's expedition, no material addition to our knowledge of these mysterious buildings has been made, and Mr. Bent's explorations are therefore of the greatest interest to geographers as well as to archæologists.

The question at what time and by what people these buildings were erected, is not merely one concerning the historical geography of Africa, but is of the utmost importance for the determination of the limits of the world as known to the ancients. Carl Ritter correctly remarked that these ruins (which were known to the Portuguese by hearsay long ago) would become the link for comparing modern and ancient geography. The 'Periplus of the Erythrean Sea' and Ptolemy—the two principal authorities on the ancient geography of Eastern Equatorial Africa—describe the territories south of the Zanzibar coast as almost entirely unexplored, and the other still extant Greek and Roman geographers knew nothing of a foreign colony in South-east Africa. On the other hand, it was clear from the outset that the buildings could not possibly have been erected by African savages. Bent's investigations led him to the conclusion that the ruins are of Arabian and pre-Mohamedan origin, and that the object of this old colonisation was the exploitation of the rich gold-fields of the country. Many indications of a strange stone- and nature-worship were found entirely analogous to the cults which were in ancient times practised in Arabia and the surrounding regions.

The most interesting feature of the Zimbabwe ruins, the great conical tower, is closely connected herewith, and Mr. Bent recognises the keynote of the worship which was practised at Zimbabwe in a most important

* 'The Ruined Cities of Mashonaland.' Being a record of excavation and exploration in 1891, by J. Theodore Bent. With a chapter on the Orientation and Mensuration of the Temples, by R. M. W. Swan. London, Longmans, Green & Co., 1892: 8vo. pp. xii. and 376.

passage of Montfaucon, in which it is stated that the ancients assure us that all the Arabians worshipped a tower. Moreover, numerous monoliths, decorated soapstone beams, soapstone birds on long pedestals, etc., etc., afford further evidence of this worship. This kind of stone- and nature-worship is so entirely antagonistic to Mohamedanism, that Mr. Bent's conclusion is inevitable—that the ruins can date only from a pre-Mohamedan period. But these ruins represent not only temples and places of worship, but also fortifications; and probably this was the first and original purpose of most of them. High and carefully-built granite walls, small entrances, narrow passages, and many interior walls and traverses are proof of this, as is also the fact that the buildings were erected on strategically well-selected sites. There can be no doubt that the foreign invaders built these strongholds, and occupied the country on account of its richness in gold.

The smelting furnace, the crucibles, the blowpipes, and the casings, which Mr. Bent discovered within the precincts of the hill-fortress of Zimbabwe, are direct evidence of this; and what enormous quantities of gold must have been produced by these ancient colonists may be judged of from the very great number of old workings, shafts, crushing stones, etc., which are found in the Mazoe Valley, at Hartley Hills, on the 'Mswézwé River, at Fort Victoria, and at many other places of Mashonaland. Mr. Bent states that wherever the pioneer prospectors have as yet penetrated, overwhelming proof of the extent of the ancient industry is brought to light. His other discoveries as to this old Arabian colony are not less interesting. The soapstone birds, already mentioned, represent hawks or vultures, and Mr. Bent points out that similar birds were sacred to Astarte among the Phœnicians, and are often represented as perched on her shrines. Many phalli and several decorated soapstone beams were found; one of the latter, which stood on an elevated platform on the western part of Zimbabwe Hill, was more than 11 feet in length. This soapstone beam is covered with well-executed geometrical patterns, and in the middle of it there is, curiously enough, the same chevron pattern with which the south-eastern wall of the great circular ruin is decorated. This pattern only runs round a portion of the beam, and Mr. Bent thinks that it may possibly have been used for the orientation of the pillar towards the setting sun. Moreover, a collection of stones of different geological origin and entirely foreign to the place was discovered on Zimbabwe Hill. All these finds prove of what importance this stone-cult was to the ancient colonists. Mr. Bent quotes Masudi, who alludes to the ancient stone-worship of Arabia as having at one time formed a part of the natural religion of the Semitic races. That the people who founded and originally inhabited this colony were not without artistic taste is evident from the fragments of decorated soapstone bowls which Mr. Bent unearthed. Bulls, zebras, baboons, and other animals are well depicted; and on one of the

fragments is represented a native hunter who shows quite distinctly the characteristic Hottentot steatopygy. This is of importance for two reasons: firstly, as a proof that Hottentots were at that time among the inhabitants of these eastern regions, and secondly, because on the monuments of Deir-el-Bahari—where, as is well known, an Egyptian naval expedition of the 17th century B.C. is described in word and picture—two African natives are depicted who show exactly the same Hottentot steatopygy.

Little importance can be attached to some indistinct lines which Mr. Bent considers himself justified in regarding as a fragment of an inscription. He admits that this lettering is "provokingly fragmentary," and it is impossible to draw any reliable conclusions from so very slight an evidence.

One of Mr. Bent's most interesting finds at Zimbabwe is that of a soapstone ingot mould, very similar in shape to an ingot of tin which was found in Falmouth Harbour, the latter being undoubtedly of Phœnician origin. This is a very curious coincidence. Did the gold-workers of ancient Zimbabwe work for the Phœnician market? Had the Phœnicians some influence not only on the industry, but also on the religion, customs, architecture, and art of these ancient colonists? It is impossible to answer these questions at the present time, but various comparative remarks which the volume contains seem to favour such assumptions. Moreover, we know that early in antiquity Phœnician navigators sailed from the northern end of the Red Sea to the unknown South. The possibility of Phœnician influence at Zimbabwe can therefore not be denied, and further investigations will doubtless throw light on this highly important question.

Mr. Bent's remarks on the ancient geography of the east coast of Africa are in some respects open to criticism. Neither did Ptolemy obtain his "provokingly vague information" from "a merchant of Arabia Felix," nor is Prasum the farthest point mentioned in the 'Periplus.' It is sufficient to read the seventeenth chapter of Ptolemy's first book of geography to see that the former statements are incorrect; and as regards Cape Prasum, it was entirely unknown to the author of the 'Periplus.' Another questionable statement is that our authorities are not only meagre, but that they were men who had no practical knowledge of the subject, and who knew next to nothing of the vast extent of commercial operations which were going on outside the limits of the Red Sea. To refute this, it is sufficient to say that the most important work on the commerce and navigation of the ancients in the Indian Ocean, viz., 'The Periplus of the Erythræan Sea,' was written by a man who was himself a navigator and a merchant, and who was well acquainted with the Asiatic and African shores of the Indian Ocean as far as to India and to the Zanzibar coast. The conclusion at which Mr. Bent arrives, viz., "that the waters of East Africa were known only

to the Greeks and Romans vaguely through a Phœnician and Arabian source," does not seem to be well founded, as a perusal of Ptolemy and of the 'Periplus' shows; but we need not go into details, as this question has already been discussed by Heeren, Mannert, Malte-Brun, Forbiger, and several others.*

The remarks which Mr. Bent's companion, Mr. Swan, has contributed to the book do not strike us as furnishing the true key to the plans of the ruins. It is evident that the peculiar wall decorations of Zimbabwe are in some way connected with the daily and yearly motion of the sun; but a glance at the plan of the great circular ruin suggests a doubt regarding the statement that at the ends of the chevron pattern (around the outside of the wall) the rays of the sun are nearly tangential to the wall, so that all parts of the wall, and those parts only which receive the direct rays of the sun when rising at the summer solstice, are decorated by this symbolical pattern (see p. 135). Moreover, no altar was found in the middle of the great ruin, and the travellers only "imagined" (see p. 101), by comparison with the temples on the hill, that such an altar might have existed. This altar should not therefore have been conspicuously put down in the plan, and Mr. Swan was hardly justified in basing two statements of the highest importance—viz., the bearing of the rising sun at the summer solstice in its relation to the sacred enclosure, and the assumed observations of meridian transits of stars—on the existence of this problematical altar.

The examination of the Zimbabwe ruins forms the principal part of the subject-matter of the volume, but it also contains a good description of the present state of Mashonaland. A number of careful ethnological observations, many remarks on climate, soil, and productions, and an interesting account about the road and river communications, the settlements and the prospects of Mashonaland, will be welcomed by those who take an interest not only in the past, but also in the present condition of this part of Africa. The volume has a large number of good illustrations, many of which are reproductions of a splendid set of photographs taken by Mrs. Bent.

ASCENT OF MOUNT DEMAVEND.

THE following is an extract from a letter of Mr. Evelyn Grant Duff, Third Secretary at the British Legation in Teheran, describing his ascent of Mount Demavend in Persia (compare the account of Sven Heden's ascent, *Proceedings*, 1892, p. 565):—

"I started on August 12th, 1892, from the Minister's camp on

* Compare also Schlichter, 'Ptolemy's Topography of Eastern Equatorial Africa,' *Proceedings*, R.G.S., September, 1891.

the Lar river for the ascent of Demavend, accompanied by Lieutenant Rosen of the German Artillery, a servant, a groom, and a muleteer. We forded the river about two miles below the camp and proceeded in the direction of the village of Rehua, from which the ascent is usually made. The natives call the distance from the Camp to Rehua four farsakhs, but it is really nearer seven. After passing the night at Rehn we set out on mules with the guide and one servant about 6 A.M. in splendid weather, intending if possible to camp at the first snow. The road was very rough and we had to walk nearly all the 16 miles which lay before us. After a long climb we reached, at 3 P.M., the tent of M. de Speyer, the Russian chargé d'affaires, who was making the ascent on that day. It was pitched at about 12,500 feet, and in the distance we saw the party making their way slowly down the face of the mountain, and I walked on some way to meet them. On arriving at the tent we found they had made the ascent in eight hours, and had taken rather over two coming down; they had spent about one hour on the top. M. de Speyer was kind enough to give us many useful hints. He told us as we afterwards found, that the ascent was nowhere dangerous but, merely *très pénible*, and only possible for people with perfectly sound lungs and heart. After we had had tea together M. de Speyer proceeded on foot to Rehua, leaving us two of his guides, and we made ourselves comfortable with rugs and went to sleep in the open, meaning to start in the middle of the night. The cold was not excessive, and we slept soundly. Shortly after midnight our servant woke us, and we started with three guides for the summit.

The difficulty of climbing Demavend is that everything breaks beneath your feet. The upper part of the mountain is composed of lava and small stones, and near the top of great masses of pure sulphur. The ascent is made along a crest of rock which runs from the foot to nearly the top of the mountain, with snow slopes on either side and a good deal of ice. About two hours after our start the moon rose lighting the country below, which looked very weird, grey, and dead. At about 16,000 feet my companion began to feel very sick, and we had to make constant halts. I was afraid at one time that he would not be able to go any further. However, he showed great pluck, and after another couple of hours began to feel a little better. Personally I did not feel sick, but my heart beat so violently that I had frequently to stop. Further up we both began to feel very sleepy in spite of the cold, which about sunrise was severe, and more than once as we halted I dropped off, and the guide woke me when we started again. The sunrise was very fine, making the icicles all round us look like flames; but the country is so brown and desert-looking that what should have been a magnificent view was like nothing but a physical geography map. We were then at about 17,000 feet as nearly as we could calculate. It was very slow work, as after every few yards

even the guides had to stop and pant for breath. They gave us garlic to eat which relieved our breathing, nauseous as it was. I noticed that one of the guides spat a great deal of blood, and all seemed to suffer. These men are not guides in the ordinary sense of the word, but merely collectors of sulphur who more or less know the way to the summit. In any emergency they would be utterly useless, and they give no assistance. When near the summit I began to feel much better, and Rosen was evidently less affected. The lava gave way to rocks of sulphur which looked very strange against the snow.

At length we reached the top of the crest of rock along which we had been crawling for so many hours, and the summit appeared quite close. The snow increased very much, but a foot under the sulphur it was so hot that it burnt one's hand, and fumes came out in some places almost violently. At the top of the crest of rock there is a kind of snow-plateau which slopes up to the summit. Here we stopped some time to examine the sulphur-rocks and to gather some fine specimens of sulphur crystals. We were now about 600 feet from the summit, which we reached at 11 A.M. after ten hours' climb. The great elevation spoils the view and dwarfs all the neighbouring mountains. The view on the Caspian side, though the day was, on the Rehua side, perfectly clear, was much obscured by thick banks of clouds over the sea. Once for a moment the clouds parted, and we could see what must have been water, but almost immediately the two great masses rolled together again, reminding one of Milton's famous simile in the second book of 'Paradise Lost.' The crater is much smaller than that of Etna, and is completely filled with snow. The whole summit seems to be one mass of pure sulphur, everything being primrose yellow where the rock showed above the snow. In the distance we could see the lake of Kum, the salt desert, and far away beyond Kasvin.

About noon, after a much needed lunch, we started for our camp. The descent of Demavend is extremely simple. You sit on the snow, preceded by a guide, and slide down on your back as far as the snow takes you. Of course one gets very wet, but the relief of doing in a few minutes a distance which has taken ten hours to ascend is immense. It was very enjoyable, and we agreed that it was worth the very unpleasant experiences of the morning. On one snow slope a herd of eight wild goats passed me quite close, and seemed indifferent to my presence. They are usually the shyest of all game. Lower down I saw several royal partridges (*Kabk-i-darri*) and the traces of many more. It is a magnificent bird, with a strange weird cry. I also saw many coveys of the ordinary French partridge. The last part of the descent after the snow ceases is very trying, the ground being covered with large rolling stones and there being quantities of a kind of thistle-like plant with thorns that go through everything. We reached our mules early in the afternoon and Rehua about dark. It was curious that neither of us felt

very tired though we had been so long on our legs. I put this partly down to the fact that we did not wear boots but Persian "givés," a kind of soft shoe, which for rock-work is preferable to any boot I have ever worn. We did not venture into another Rehna house, but slept on the grass, and next morning rode back to the Minister's camp in time for luncheon."

ANGLO-PORTUGUESE DELIMITATION COMMISSION.

MAJOR LEVERSON and the other members of the Commission for the Delimitation of the Anglo-Portuguese Boundary in East Africa, reached England early in January, having had to suspend their labours in the middle of November owing to the commencement of the rainy season, which rendered further survey operations almost impossible.

The work executed during 1892 includes the determination of the latitude and longitude of Massi-Kessi, and the survey of a narrow strip of territory running south from about latitude 18° S., and longitude 33° E., to the north-eastern corner of the Transvaal (i.e., the junction of the Limpopo, and Pafuri, or Unvubu Rivers). The longitude of Massi-Kessi was fixed by Captain S. C. N. Grant, R.E., by the method of moon-culminating stars in accordance with the recommendations of the Astronomer-Royal. The observations were taken with a portable transit instrument specially constructed for the purpose by Messrs. Troughton and Simms. It was impossible to make use of the telegraph, the nearest station being at Fort Salisbury, about 200 miles distant.

The results obtained were as follows:—Longitude of the observatory in the British camp near Massi-Kessi, $32^{\circ} 51' 24''$ E. of Greenwich, and latitude $18^{\circ} 53' 33''$ S. Between latitude 18° S. and the Sabi River a regular triangulation was carried out, 6-inch and 7-inch theodolites being used for the purpose. The detail was sketched in with plane-tables.

From the Sabi to the Limpopo, owing to the dense bush and total absence of conspicuous points, it was quite impossible to continue the triangulation, and the work done in the section between those rivers consists of route sketches, and the fixation of numerous points by observations for time and latitude. The junction of the Sabi and the Lundi was found to be situated a few miles west of longitude $32^{\circ} 30'$ E., and that of the Limpopo and Pafuri somewhat to the south, and far to the west of what it is shown to be on most maps.

The *personnel* employed on the survey work included Major J. J. Leveson, R.E., Captain S. C. N. Grant, R.E., Lieutenant C. S. Wilson, R.E., and five non-commissioned officers of Royal Engineers. Captain F. E. Lawrence, Rifle Brigade, and Dr. Rayner, Grenadier Guards, accompanied the Commission. Several Portuguese officers were also engaged

in map-making, but usually worked independently of the British party. An agreement was, however, always come to with reference to the fixation of the most important points.

The most northerly point reached by the Commission is in the valley of the Gaveresi, a little north of the main watershed separating the basins of the Zambesi and the Pungwé. The pass by which this watershed was crossed was about 4600 feet above the sea. Other high passes crossed by the Commission were the pass between the basins of the Sabi and the Pungwe near Umtasa's Kraal, 5400 feet, and the Chimanimani Pass, 5200 feet. The whole country as far south as the Umswili River is extremely mountainous, and is traversed by numerous streams. South of this it gradually sinks towards the Sabi River, and becomes less fertile and less well watered.

Between the Sabi and the Limpopo (locally called the Umiti) the country is almost a dead-level plateau raised a few hundred feet above the rivers. It is covered with thick bush, is very sparsely populated, and has a very poor soil. Water is scarce—all the rivers between the Lundi and the Limpopo being, at the time of the visit of the Commission (September), mere sand-beds with very occasional small pools of water.

The Umswili River, of which little appeared to be known beforehand, was explored from the point where it debouches into the plain, near Gungunyane's old kraal, almost to its source, and was found to run for nearly all its length through a beautiful gorge, and to consist of numerous long still reaches separated from each other by rapids.

Where crossed by the Commission the Sabi, the Lundi, and the Limpopo Rivers ran in sandy beds from a quarter of a mile to a mile broad, large portions of which were dry. At the fords the water was nowhere more than 2 feet deep.

About 5 miles above the junction of the Sabi and the Lundi an important series of cataracts and rapids, which it is believed are not marked on any map, were discovered on the former river. Their origin appears to be due to the intrusion of a broad dyke of porphyry through which the river has had to force a channel. The scenery in the neighbourhood of the cataracts is very grand and weird. The site is somewhat difficult of access, and the Commission had, unfortunately, not sufficient time to make a thorough exploration of them, nor to determine their total height or length.

THE WESTERN LOWLAND OF ECUADOR.*

By Dr. Th. WOLF, late Government Geologist to the Republic of Ecuador.

THE Western Lowland of Ecuador forms, of course, the smallest part of the country; but it is the most beautiful district along the Pacific coast of South America, and the one on which nature has been most lavish. Its superficial area is about 28,950 square miles. As late as the end of the tertiary period the waves of the ocean washed the foot of the Western Cordillera of Ecuador; the only parts of the land which may have projected above the water in the form of islands being a narrow chalk ridge of hills, which runs from Guayaquil westwards to the sea, and then northwards through a portion of the province of Manabá, together with some isolated summits of greenstone. At the commencement of the quaternary period a part of the northern half of the lowland appeared above the ocean, while the southern half was covered over by an immense sandstone formation. The latter, containing every here and there the bones of mastodons and horses, was, at a very recent period, subjected to upheaval, which gave to the country very nearly its present configuration. The great low-lying plain east and west of the Gulf of Guayaquil, as well as smaller alluvial plains at the mouths of certain coast rivers lying only a few feet above the sea-level, are quite recent formations, produced by the gradual filling up of the gulf, which was formerly of much greater extent, with the shingle and mud brought down by the streams. It is a true delta formation, and the process is still going on. The highest points of the coast ridge attain an elevation of about 2300 feet in the chalk range between Guayaquil and the sea, and in the Cordillera of Chongon and Colonche. In the tertiary region there are summits of from 650 to 1000 feet. The quaternary marine strata forms a gently undulating country, rising from 65 to 200 feet above sea-level, while the extensive plain of alluvium is quite level. The rivers, which issue from the Western Cordillera, do not flow due west; but, in consequence of the chalk range which runs north and south, form two extensive river systems, the larger and more beautiful of the two—viz., that of the Rio Guayas, with its complicated network of canals, emptying itself into the Gulf of Guayaquil; the other system (northern), that of the Rio Esmeralda, pouring its waters direct, without any delta, into the sea exactly at 1° N. lat. The two systems are divided by some gently-rising ground, where the headwaters of both sides are so interlaced that a small canoe could easily make the passage from one river system to the other. Although the northern and southern halves of the lowland present many points of agreement with each other as regards their hydrographical and orographical features, they are very distinct as regards their climates and in other respects. The northern is virgin country, covered with humid forests, and almost uninhabited, whereas the southern is a cultivated region, very diversified, and well populated. The boundary between the two lies roughly along a line drawn from Cabo Pasado in a south-easterly direction towards Chimborazo.

The ocean north of Cabo Pasado has a mean temperature of 82° (Fahr.), south of the same point, of only 73°. This circumstance exercises an important influence upon the climatic conditions of the Ecuadorian lowland. In the north a hot and fairly moist climate prevails, in which the dry and wet seasons of the year are not sharply defined, and in consequence of which the country is clothed

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with a luxuriant and evergreen vegetation. The highest temperature, viz., 28° (Fahr.), prevails there on the coast, and falls in the shady forests to from 77° to 79°. The wealth of water is enormous; but the water is nowhere stagnant. On the contrary, it is quickly-flowing, and, consequently, the climate is not unhealthy. Very few mosquitoes or other pests are met with. The magnificent primeval forests are rich in palms, excellent timber, coco-nut trees, caoutchouc, and vanilla plants.

In spite of the rich humus, the country is for the most part uninhabited, and the population, which numbers only about fifteen thousand souls, is settled almost exclusively along the sea coast. Very little attention is paid to the cultivation of the soil. The chief town, Esmeralda, consists of a collection of thatched houses, with about 600 inhabitants. There is not a single bridle path in the country, with the exception of the natural path which the sea-shore affords at low tide. Trade along the coast and with the interior is, therefore, carried on only by means of boats and canoes. The reason why this region is so sparsely populated is that the number of immigrants coming into Ecuador is too small. About fifty years after the conquest, the settlement of Ecuador by the Spaniards was finished. After this scarcely one important place was founded. It does not now occur to any of the poor highland people to migrate from their barren homes down into the rich forests of Esmeralda, and become prosperous by the cultivation of cocoa and coffee. A further reason is to be found in the absurd but absolute prohibition of the Spanish Government, repealed again and again during the last two centuries, against forming a harbour north of Guayaquil, or opening up a route from the coast to the Highlands. From the time of the conquest numerous Indian tribes have inhabited these coasts; but now they have practically disappeared, and their scattered remnants have become so mixed with the white and black population as to become unrecognisable.

Only one race has kept itself pure—viz., the Kayapas, of the valley of the Rio Santiago, who, shut off from the rest of the world, lead a lazy life in their beautiful palm forests. Their language distinguishes them from all the other races of South America at present known. The tribe numbers now about two thousand five hundred. A curious phenomenon in the forest region of the Esmeralda is presented by a couple of pure negro villages on the River Santiago—viz., Uimbi and Kachabi, which date from the time of the emancipation of the slaves (1854). These former negro slaves have associated themselves together in the forest solitude, with the object of leading a purely African life, free from disturbance, according to their own liking, and of indulging in the "*dolce far niente*," surrounded as they are with an abundance of bananas and other easily obtainable food. They go about almost naked, and have become regular but harmless savages again. When the negroes want money, say for brandy, they wash gold, for the whole basin of the Rio Santiago is very rich in gold and platinum.

The southern half of the Ecuadorian lowland presents quite another picture. In the first place the climatic conditions are different. On the sea-coast it is fresh and pleasant, but the further east one goes the hotter it becomes. In the coast regions, on the Island of Puná and the Great Peninsula of Morro, along the coast from Manta to Bahía de Caráques, a mean temperature of from 73° to 77° (Fahr.) prevails; it rains very little here, the short rainy season often lasting only two months (February and March). In the low and hilly stretches of country, the so-called cactus and mimosa vegetation prevails. A sparse and ephemeral grass crop covers the ground from February to April, but for the rest of the year everything is scorched up, and of a brownish grey colour. Where no artificial irrigation is possible it is out of the question to expect extensive cultivation. The

forests which clothe the mountains lose their leaves in the dry season; they are rich in the hardest timber and in certain resins and balsams. The climate is wonderfully healthy and pleasant, like that of the coast of Peru. It is the only part of Ecuador where there is a lack of fresh water. On the Island of Puná and the Peninsula of Morro there is not a single stream. Only where the higher mountains approach quite close to the coast, as for example, north of Santa Elena at Manglar Alto or south of Guayaquil, between Naranjal and Machala, the character of the country changes, and there is an abundance of streams and evergreen woods; but elsewhere brackish cistern-water is the only water available. When we advance a few miles from the coast into the interior the climate changes; the temperature and humidity increase, and the vegetation consequently alters in character. Guayaquil possesses a mean temperature of from 79° to 81° , with regular wet and dry seasons, the former lasting five and the latter seven months. The nearer we approach the foot of the Cordillera the shorter the summer or dry season becomes, and the longer the winter or rainy season, until we arrive at the lowest slope of the mountains, that muggy, ever-moist region of primeval forest where it rains almost throughout the whole year, at least every night, and where a mean temperature of 82° prevails. This region is badly situated for health. But otherwise it may be said that all the rest of the lowland has, for the tropics, a good and healthy climate, and that the climate has unjustly been very much decried by superficial travellers, because yellow fever appears here and there. Yellow fever is not endemic in any part of Ecuador, but is always imported, particularly from Panama, through insufficient quarantine measures. The dry season comes to an end in December.

After the first refreshing rains the aspect of the country changes as if by magic; the savannahs are covered with an emerald-green carpet of grass and plants, the bushes and trees assume the richest covering of leaves and flowers, animal life wakes up, and it is astonishing what vegetation produces under the influence of warmth and moisture; by July most plants have cast off their leaves again. The enormous wealth of water in the many large rivers makes up for the absence of rain in the summer months in the plains bordering them. The zone of evergreen trees, which is identical with that of the cacao, commences in the river system of the Guayas on the Rio Daule, on the main stream (the Rio de Babahoyo) somewhat above Zamborondon, on the Rio Chimbo above Yaguachi. The whole river system of the Rio Guayas may be described as one great paradise. Plantation after plantation, hacienda after hacienda, extend along the main stream; every house is surrounded by magnificent fruit-trees, bananas and palms. Now we wander for hours through the dark green cacao forests, now through low coffee bushes, again over bright green fields of rice and sugar-cane, or along the steep slopes of darker tobacco fields; suddenly we find ourselves for a short stretch in dense forest, where the monkeys are chattering; then we come upon thousands of cattle and horses pasturing on the open savannahs. These savannahs, with their great isolated trees or clumps of bamboo grasses, 20 feet high, present a wonderful sight. The cacao forms the chief wealth of the country. In spite of an extremely primitive system of cultivation, Guayaquil exports on an average 10,000 tons a year. An almost incredible quantity of tropical fruits is shipped weekly on the great Pacific steamers and sailing vessels for the Peruvian and Chilean coasts, which are also supplied with timber and with the famous bamboo cane (Caña de Guayaquil) of Ecuador.

The population of the region dealt with may be estimated at about two hundred and ten thousand, of which about twenty thousand may be regarded as belonging to the white races; the remainder consists of negroes, Indians, and hybrids. The so-called Panama hats form the chief industrial product. These hats are

made from the fibre of the "toquilla" or hat-palm (*Carludovica palmata*) by the Indians of the dry coast regions, and the price of them is from half a dollar upwards; for a hat of the finest description, on which an Indian works for five months, as much as from 100 to 150 dollars is paid in the Antilles. Guayaquil with its forty-five thousand inhabitants is a rapidly progressing and flourishing town, which in the course of the last fifteen years has doubled its population. While the people of the highlands are as a rule reserved, fanatical, close-fisted, and conservative, the inhabitants of the depression are full of life, open, lavish, tolerant, and liberal-minded in every respect. There is a great contrast between life in the sad, melancholy high valleys and the stirring activities of the rivers, on which often from fifteen to twenty steamers and hundreds of other craft carry on trade.

THE MONTHLY RECORD.

THE SOCIETY.

Educational Lectures.—The first of the series of ten Educational Lectures, by Mr. H. J. Mackinder, was given in the Hall of the University of London, Burlington Gardens, by the kind permission of the Senate, on Friday, January 20th. There was a very large audience, many of whom were teachers. The subject of the series is "The Relations of Geography to History in Europe and Asia." The first lecture dealt with "The Theatre of History," and was richly illustrated with special maps and diagrams, shown on the screen by means of the lantern.

Mr. Mackinder said that in considering the influence of geographical environment on human history, it is essential, as in all departments of historical inquiry, that we should bear in mind not merely facts as we now know them, but also men's former beliefs concerning them. Therefore he commenced this course of lectures on "The Theatre of History" with a brief survey of certain aspects of the history of geography. In one point especially the present differs from the past. All the earlier ages had an outer and an inner geography. Before Columbus and Da Gama the theatre of history was girt by the unknown; now the unknown is besieged in its last retreats by the known. Men's minds have a new definite environment in the place of limitless possibilities. The imagination of Homer fed on the suggestions of the half-known, and played freely in the *outer geography*. With the theory of the sphericity of the Earth came the necessary consequence of a limit to the discoverable. The contrast between the discovered "œcumene" and the remainder of the globe's surface is in the background of all Greek geography. Was the œcumene an island encircled by ocean, or did one continuous continent isolate the ocean-lakes? Was there a second, an Antipodean œcumene, inhabited yet inaccessible? These were questions which fascinated the pagan philosophers. Early Christendom all but suppressed the theory of the sphere, but the idea of the œcumene lived on in men's minds, though deprived of its supporting globe. It reverted indeed to its primitive circular outline. At the geographical renaissance globe and œcumene were rejoined, the latter exaggerated in length, the joint work of Ptolemy and Marco Polo. The result of the error was that Columbus discovered a new "world" (œcumene). The theory of a third—the Antipodean œcumene—was exploded only by James Cook. As a result of this history the world is to-day full of misnomers, registers of half-knowledge.

These in turn tend to mask facts. In the next lecture it will be seen whether the masks cannot be torn off and the facts left patent.

The second lecture was given on the 27th, the subject being, "The Roads to the Indies."

The succeeding lectures will be on the following subjects:—

"The Belt of Desert and Steppe."

"The Gates of India and China."

"The Approaches to Europe."

"The History of Russia as a Commentary on its Geography."

"The Alps as a Factor in European History."

"The Approaches to Italy."

"The Divisions of Gaul."

"Some Geographical Analyses of British History."

Lectures to Young People.—The two lectures to young people given by Mr. John Coles, the Society's Map Curator, on December 30th and January 6th were attended by large audiences both of young and old, the former, of course, predominating. The numerous pictures shown on the screen were themselves full of geographical information, and these Mr. Coles supplemented with facts and anecdotes of personal adventure in such a way as to maintain the interest of the audience throughout. That the lectures may be regarded as decidedly successful seems evident from the fact that the attendance at the second was even better than that at the first.

EUROPE.

The Marshes of West Russia.—It is stated, in an official report, that out of the 16,000,000 acres of swamps which cover West Russia, nearly 6,750,000 acres have already been covered with canals during the last fifteen years. The aggregate length of these canals attains 2196 miles. Many interesting facts have been brought to light during these works. It appeared that whole rivers and small streams, which previously existed, had been silted up with mud and sand. In one river which had been formerly barred for building a water-mill, the wheel of the mill was found under 3 feet of mud, which shows the rapidity of the accumulation of silt. The bottom of Lake Jid or Knyazozero, which was supposed to be unfathomable, proved to be 56 feet higher than the level of the Pripet river, and the lake could thus be partially emptied. The net result is that more than 800,000 acres have been transformed into meadow land; nearly 1,200,000 acres of forest land, which were formerly impracticable marshes, have been dried, and nearly 1,250,000 acres of good forests have been brought within distances of less than 5 miles from some one of the canals, so that timber can easily be exported. The fevers which were endemic in the marshy regions are undoubtedly reduced, and the terrible disease of the hair, the

plica polonica, is said to have entirely disappeared. The Pinsk marshes have, however, rooted themselves so firmly on the map of Russia that they are still represented in the best non-Russian atlases as covering an enormous area on both banks of the Pripiet, although they are now practically obliterated from the land itself, and their site is covered with prosperous farms. M. Venukoff submitted a note to a recent meeting of the Paris Academy of Sciences, pointing out this common cartographical blunder, and correcting it. He states that since the great reclamations the peasants of the district have been enriched by the increased value of the land, and that it is proposed to bring immigrants from Great Russia, where the population is excessive, to occupy the new lands.

ASIA.

The Pamirs.—M. Ximénès, of the Paris Geographical Society, gave a lecture at Moscow, in the early part of January, on his recent travels in the Pamirs. In the course of his remarks, he is reported to have said, "This country is by no means so wild and miserable as has been asserted. . . . Its magnificent pasture lands afford nourishment to herds of superb cattle and excellent mountain horses; and nature here offers many charming aspects, with its clear sky, majestic mountains, mighty glaciers, rapid torrents, azure lakes, and green plains. Moreover, minerals are to be found in abundance, including rubies of great value." The reference to pasture seems to require some qualification. Captain Younghusband (*Proceedings*, 1892, p. 225) states that on the Pamirs, although grass is plentiful in certain localities, it covers only a small proportion of the valleys; while Mr. Littledale (*ib.* p. 15), who was told by a Kirghiz that grass grew luxuriantly on the Great Pamir, found nothing but utter barrenness. M. Ximénès, according to the summary of his lecture, which has reached England, states that the Alai Valley is occupied by three Kirghiz tribes, numbering more than 17,000 *kibitkas*. Reckoning that each *kibitka* contains five persons, this would give a total population of 68,000, which is within 1150 of the estimate made by Colonel Kostenko in his gazetteer ('The Turkestan Region,' 1880). M. Ximénès enters at length into the political questions connected with the Pamirs. Here it is enough to say, that in his opinion, the whole of Afghan Turkestan, together with the States on the Upper Oxus, "naturally forms part of Russia's possessions, notwithstanding international agreements and conventions to the contrary."

The Transcaspian Territory.—The Russian *Official Messenger* summarises the results of the ten years' Russian occupation of the Transcaspian territory as follows:—The territory covers 220,450 square miles, and is divided into five districts—Manghishlak, Krasnovodsk (which includes the Chikishlar and Karakalinsk cantons), Askabad (Durun and Atek cantons), Tejen, and Merv (Seraks, Penj, and Elotan

cantons). Its population numbers 280,443 natives and 16,351 immigrants. The former are chiefly Turkomans (chief stem, Teke), and a few Kirghizes in the Krasnovodsk and Manghishlak districts. The Turkomans are neither entirely settled nor entirely nomadic; but their *auls* (villages) have each their distinct water, gardens and fields. However, only part of the inhabitants have permanent dwellings, the remainder camping with their herds. They are divided into two groups—the *charvâ* and the *chomurs*. The former are the richer class, and depend chiefly upon their live-stock, following their sheep and camels over the steppe. The *chomurs* are the poorer class. They have no herds, and stay in the villages. The Turkomans are not very industrious, and the forts and canals of their villages have chiefly been built by their Persian slaves. All housework is done by women. They are not very religious, and have but few mollahs. They follow the customary *lex talionis* with tribal responsibility for some crimes. The penalties of capital punishment, or cutting off a hand for stealing, and the like, have been abolished since the establishment in the territory of Russian judges, who, nevertheless, pronounce their sentences as far as possible in accordance with the customary law. Raids upon the neighbours are dying out, and efforts are being made to encourage agriculture, and especially irrigation. Some waterworks are carried out by the Government, but the system is chiefly to encourage the *auls* (communities) themselves to repair the old wells and canals, and to dig new ones. Loans without interest are made for that purpose to the *auls* from a special irrigation fund. The management of all matters connected with the distribution of water is left in the hands of the *auls* and their elected *miraba*. The usual crops of wheat and barley are from 12 to 20 bushels for each bushel sown. Lucerne, rice, millet, and cotton also give good crops. The melon-orchards are in a satisfactory state. On January 1st, 1890, it was reckoned that there were on the territory 1,818,615 sheep (34 per family), 115,320 camels, 59,255 horned cattle, 83,890 horses, and 35,570 donkeys. Various domestic trades in leather, silver, arms, and so on, are carried on by the Turkomans. Salt is now extracted to a considerable amount, and in 1889 about 10,000 tons were exported to Persia. Naphtha is found in profusion on the Cheleken Peninsula; asphalt and ozokerit have been discovered in the Balkan Mountains. Sulphur is obtained in the Askabad and Krasnovodsk districts; lignite and coal are found in the Manghishlak Peninsula. The yearly returns of trade (import and export) amount to £950,000. As to the Transcaspian Railway, it appears that in 1891 no less than 72,683 tons of goods were imported into Russia from Central Asia by this railway, out of which 42,336 tons were raw cotton (as against 18,814 tons in 1888). The exports from Russia on this line were chiefly sugar, £750,000 (owing to the bonus offered by the Government), manufactured goods (203,000 cwt.), kerosene oil (29,890 cwt.), and timber.

Forests in Russian Turkestan.—Russian Turkestan is so poor in forests, and the existing woodlands have suffered so much of late from reckless cutting, that attempts are now being made to replant, partly in the mountains, and partly in the Steppes. It is estimated that of the total area of Turkestan (162,000,000 acres), the territory has but 945,000 acres of forest land in the mountains, and nearly 16,000,000 acres of bushland in the Steppes. As to the plantations of trees which are met with in all native towns and villages, they cannot even satisfy the wants of the steadily increasing population for building purposes. The saxaul tree has been pitilessly exterminated all along the banks of the Syr-daria, and for a great distance around the centres of population, and, as natives say, "the saxaul has fled into the depth of the Steppes." The forests in the mountains were also recklessly cut down till the year 1879. At the same time, the whole of the region is, from some physical change, generally undergoing desiccation. Both glaciers and rivers are decreasing; the lakes dry up; the extremes of temperature become more marked; and the moving sands are increasing in areas. The recent attempts at planting forest trees, without irrigation, which were made in the province of Samarkand in 1880, have proved quite successful; so also the attempts made in the dry Steppe in the south of Samarkand, between the Shaar-sabiz Mountains and the Dargh Canal, where nearly 400 acres were planted. Since 1880 the system has been improved, the young trees being now planted on the slopes of the hills in terraces, which follow the contour lines.

Exploration in Eastern Siberia.—The important expedition despatched in July, 1891, to explore the valleys of the Kolyma, Indigirka, and Yana, under the leadership of the late M. Cherski, is not to be abandoned, although its leader has died, the Academy of Sciences of St. Petersburg having entrusted the leadership to Baron E. Toll, well-known for his exploration of the New Siberian Islands. Recent news as to the discovery of mammoth remains at Sachaurach, not far from Kasachje, has given a new turn to the expedition, which will proceed next spring to that place. Baron Toll intends to follow this stream both upwards and downwards to the Arctic Sea, and if possible to make an excursion westwards.

Seismological Work in Japan.—Professor Milne, F.R.S., sends a recent issue of *The Japan Herald*, in which he summarises the seismological work done in Japan up to the present time, most of which has been accomplished by members of the Seismological Society, established in that country in 1880. The first great problem was naturally that of devising an instrument which should afford accurate quantitative measurements of the vertical and horizontal components of earthquake motion; and so fully has it been solved that it is now possible not only to determine the period and amplitude of shocks of earthquake,

but to recognise tremors due to strong high-level winds blowing against a range of mountains even at distances of 200 miles. A very extensive field of inquiry has thus been opened up, and although considerable time must elapse before seismologists are in possession of sufficient data to settle some of the larger questions raised, the discussion of records already obtained has yielded results of great interest. It appears that an earthquake in which the amplitude of motion amounts to $\frac{1}{8}$ inch, is quite perceptible, and sometimes even alarming in its results, while an amplitude of 2 inches, with a short period, would probably cause widespread destruction. The back and forth movements constituting the *shock* usually have a period of one or two seconds, while the ordinary shaking motion has in most cases a period of one-third to one-fifth of a second, increasing considerably towards the end of the disturbance. In severe earthquakes the amount of motion decreases rapidly below the surface; hence houses with a sunk flat and free area are found to escape in a remarkable manner. Besides appointing a committee to deal with such practical questions as the protection of buildings, the Japanese Government has established an Earthquake Bureau under the Meteorological Department. Seismographs have been erected in several districts, and over seven hundred stations record "eye-observations" of earthquakes. From the data obtained in this manner it has been ascertained that the greater number of shocks occurring in Japan originate near the eastern coast, that there are numerous definite centres of energy of greater or less intensity, and that on an average at least two shocks are felt daily. The extent of land area shaken varies in a striking manner from year to year, but it has not yet been possible to connect its variations with those of any meteorological or other element. Professor Milne concludes his paper by sketching the programme of the Seismological Society for the immediate future, which includes no less than eight separate investigations: velocity of earthquake propagation, involving questions of the earth's rigidity; variations in the value of g ; submarine observations; magnetic observations; bending of the Earth's crust; tremometric observations; earth-currents; and earth-oscillations. Other investigations of scarcely less interest and importance have become possible with the improvement of seismographs, or have been suggested in the course of the work on earthquakes. Amongst these may be mentioned the calculation of ocean depths from the rate at which waves are propagated along the surface, the automatic recording of the velocity of a railway train, the detection of irregularities in the line due to want of ballast, imperfections in bridges, etc., and the effect of artificial earthquakes caused by explosions or the falling of heavy weights.

Major Raverty's Work on Afghanistan.—The India Office has at length issued the fifth section of Major H. G. Raverty's 'Notes on

Afghanistan, and part of Baluchistan, geographical, ethnographical, and historical, extracted from the writings of little-known Afghan and Tájik historians, geographers, and genealogists, the histories of the Ghúris, the Turk sovereigns of the Dihli kingdom, the Mughal sovereigns of the house of Timúr, and other Muhammadan chronicles, and from personal observations.' The previous sections of this important work have been noticed in the *Proceedings*, viz., in Vols. II., 708, III. 692, and VI. 354. The fifth section appears to be the concluding one, and it would have been larger than all the other sections put together, but we learn from an official note that the work has been brought by the India Office to a "premature end," for reasons which, however, do not transpire. This is regrettable, for the amount of information, research, and learning contained in the three hundred and odd folio pages now issued, and, indeed, throughout the entire work, is really astonishing. To give a detailed account of the contents of the present section is difficult within the limits of a short note; but we may mention that it includes a complete list of the passes across the Sulimani Mountains, debouching into the Bannu and Dehra Ismail Khan districts. These passes, alone, amount to no less than ninety-four in number, a fact which will astonish those strategists who talk about the facility of blocking or guarding the north-western passes in the event of an invasion of India. Other information in the same section relates to the various routes and to the tribes scattered about the region adjoining the British boundary from the Hindu Kush to Sind. For instance, a full account is given of the Powandas, or Povindas, the well-known nomads who follow mercantile pursuits, and travel backwards and forwards between the Afghan highlands and the plains of India. The author also treats of the Waziris, Sheranis, and other large tribes, as well as of the district of Sibi, to which about 70 pages is devoted. The scholarly accuracy of Major Raverty, whose knowledge of Pushtu, Persian and other Oriental tongues enables him to derive his information from original sources, is patent throughout the work. We trust that the author will be enabled to complete the work on the lines originally laid down, and in that case he will doubtless take steps to have a proper index prepared under his own supervision, that attached to the present volume being, we regret to say, very inadequate. It would also conduce largely to the usefulness of the work to have an analytical table of contents and a good map.

AFRICA.

Captain Binger's Expedition from the Ivory Coast to the Southern Sudan.—At the meeting of the Geographical Society of Paris on December 16th, M. Marcel Monnier, who was a member of Captain Binger's last expedition to the heart of the Sudan, gave a full account of

his journey and of the work accomplished by the mission. The object of the expedition was two-fold—first, to act in conjunction with the delegates of the British Government in determining the boundary line between the French territories on the Ivory Coast and the British possessions on the Gold Coast, according to the protocol of June, 1891; and secondly, to explore the Southern Sudan from Bonduku to Kong, and to consolidate French influence in the regions visited by Captain Binger three years before. The expedition landed at Assinie on January 11th, 1892, and separated into two sections after leaving Nugua, one under Lieut. Brault and Dr. Crozat proceeding straight to Dibi; the other, under Captain Binger, making a *détour* by way of Alankabo and N'Gakin. The journey through the dense forest belt, which extends from the coast almost up to Bonduku, was most toilsome. It occupied no less than eighty-four days, and M. Monnier gives a vivid description of his experiences. He states that even in the Cordillera and in the forests of Java, he did not meet such difficulties. In the course of two days' march, soon after leaving Nugua, fifty-seven watercourses were forded. The supply of provisions was precarious, and the delays at the villages in the clearings were most wearisome. Great was the joy of the whole party on reaching Sapia, on the verge of the forest, and only five hours' march from Bonduku. Just before entering the latter town, the chain of hills, which forms the watershed between the basins of the Comoe and Volta, is crossed. On April 29th the expedition entered Bonduku. The greatest drawback to this place is the want of water. The person who exercises most influence there is the Almamy, or religious chief, whose decisions have the force of law. Ibrahima Kitaté, the Almamy of Bonduku, showed himself most friendly to the travellers. The population may be estimated at from seven thousand to eight thousand souls. The town is well situated commercially, commanding, as it does, the whole of the trade of that part of the great bend of the Niger. The journey from Bonduku to Kong, a distance of 190 miles, occupied seventeen days. There is a path, practicable for beasts of burden; the country is very monotonous, consisting of a succession of slightly undulating plateaux and a desert, covered with tall grasses with a few clumps of trees. The expedition arrived at Kong on May 27th. Kong is more healthily situated than Bonduku; it stands on a table-land at an altitude of 2300 feet. The population is two or three times greater than that of Bonduku. The old king of Kong, Karamoko Uli, had not forgotten the treaty made by him with Captain Binger three years before, and he gave the expedition a cordial welcome. At Kong news arrived of the massacre of Captain Ménard on the frontier of the States of Samory. About the middle of June the expedition separated, Dr. Crozat, the news of whose untimely death from fever arrived in Europe quite recently, proceeding northwards to the country of Tieba, Lieutenant

Braulot eastwards to the district of Buna, and M. Monnier, with Captain Binger, returning to the coast through Jimini and Diammala. From Kong to Dakhara, the capital of Jimini, Captain Binger followed his old route, but afterwards diverged to the south-west in order to traverse Diammala, a country hitherto unknown. After three days' marching from Jimini the traveller passed from the basin of the Comoe into that of the Isi and crossed the Be, one of its principal affluents. One day more brought him to Satama, the capital. The country is well wooded and rich. Maize and other products are cultivated generally. The people, who had never seen a white man, received Captain Binger well, and a treaty was soon concluded with the king. Through Diammala lies the most direct route to the coast; it is the key of Bawle, and, further, comprises in its dependencies the country of the Gaunes, one of the principal centres for the production of the "kola," so much sought after by the natives of the coast. On continuing their journey further into Bawle, the travellers were unexpectedly brought to a standstill at the village of Siradine-Tombo by the hostile attitude of the natives. They were then only a few miles from Wassaraduga, on the River Isi, down which they had intended to proceed to the coast. However, a retreat had to be made to Satawa, and then striking off to the south-west, they made their way to the Comoe, and fifteen days later reached the coast, after an absence of six months. The expedition altogether covered about 1245 miles of country, of which about 350 were over quite new ground.

From the Mobangi to the Shari.—Early in the year 1891 the French Government determined to despatch an expedition into the interior of Central Africa in support of the great expedition, then being conducted by the unfortunate M. Crampel to Lake Chad. The mission was entrusted to M. J. Dybowski, and his instructions were to penetrate from the Mobangi as far as possible into the interior of the central plateau, and to establish a series of posts with the view of consolidating and extending French influence in that region, and finally to effect a junction with the Crampel mission. At the meeting of the Geographical Society of Paris on the 18th November last, M. Dybowski gave an interesting account of his travels. At Brazzaville, in the middle of July, the news arrived of the massacre of Crampel, but M. Dybowski determined to proceed northwards on his mission. He was accompanied by five Frenchmen and about forty-two armed natives, besides porters. The party left the Mobangi at Bembe, the point from which the Crampel expedition had a year before started, and struck due north through the forest. It was not long before an encampment of Musulmans was encountered, and M. Dybowski was assured by one of Crampel's sharpshooters, who had made his escape from them, that they were the same party which had massacred the Crampel expedition. The Musul-

man camp was attacked and captured; the resistance was not great, but a number of the enemy were killed. Advancing further into the interior, the traveller arrived after ten days' marching at the point where the unfortunate Lauzière and Biscarat, of the Crampel mission, fell. The remains of the former were exhumed and brought back. The furthest point reached was just north of the River Shari ($7^{\circ} 26' 30''$ N. lat., and $17^{\circ} 54' 30''$ long. E.), where it was found necessary to turn back, as provisions were failing, and the country ahead had been laid waste by robber bands of Musulmans. The country between the Mobangi and the Shari is one of the most prosperous and richest in Africa, and possesses an industrious population. Its prosperity would be greater were it not for the depredations of the hordes of Musulmans from the north. In the countries of Langwassi, Dakona, and N'gapu, the cultivation of maize, sorghum, &c., is general. The watershed between the basins of the Mobangi and the Shari lies a little to the north of the sixth parallel. The chain of hills forming it is composed of ferruginous rocks. Iron smelting is the most important industry in this district. Cotton and tobacco are grown extensively. In all the forests there is an abundance of creepers (*Landolphia*) yielding a caoutchouc of excellent quality. On the banks of the Shari the traveller came across a forest of bamboos measuring not less than from 50 to 60 feet in height. In the same region, along the small streams and in the swamps, he found numerous specimens of the wild date-palm. The Shari, at the point where the party crossed it, was about 65 yards broad; but it was evident that during the rainy season it is three or four times as broad. Its depth was from 13 to 16 feet. After returning to the Mobangi, M. Dybowski explored for a short distance the Ombella, and for a further distance the Kemo, another tributary of the Mobangi. A station was established at the junction of the two rivers, and another post on the Kemo in lat. $6^{\circ} 17'$, which was the extreme point reached on that river. Through all this region the traveller searched in vain for the so-called Lake Liba. He supposes that one of the numerous inundations, so common in that district, must have given rise to the reported existence of such a lake. M. Maistre, who is in command of another expedition, sent out to support that of M. Dybowski, writing from the station of Kemo, on the River Kemo, June 25th last, announced his intended departure for the north, across the country of the Togbos and N'gapus. He will then turn obliquely to the north-west and endeavour to reach the country of the Sara and the southern frontier of Bagirmi, thus connecting his itinerary with that of Nachtigal in the direction of Gundi. His expedition is composed of five Europeans (two of whom, MM. Briquez and Brunache, were members of M. Dybowski's mission), sixty-four Senegalese as an escort, and a hundred porters.

Lieutenant C. H. Villiers' Expedition in North-East Africa.—In a letter dated Lamu, December 1st, 1892, Mr. J. W. Gregory gives further information with regard to the movements of the exploring party under the command of Lieutenant Villiers. In consequence of the reported hostility of the natives in the neighbourhood of the Jub, it was deemed expedient to give up the original intention of proceeding to the interior by way of that river, and the party proceeded to Lamu, where all the men and stores were landed, these latter having been much damaged, while on board the steamer, during a heavy gale. The route it is now proposed to follow is up the Tana River, thence by Mount Kenia to Lake Rudolf, and after exploring the surrounding country, to proceed west to Bardera on the Jub River. From this place the party will turn northward and endeavour to cross Somaliland to Berbera. At the time of writing the party was much divided, Dr. Mackenan, with a party of seventy Abyssinians and a like number of Swahili porters, was marching to Ngoa, on the Tana, to form a camp. Sir H. Tichborne, Lieutenant Stanford, and Count Lovatelli, an Italian who had joined the expedition, had left with two companies of Somalis *en route* for Ngoa; Lieutenant Villiers was at Lamu, and Mr. Gregory was in camp near that town in charge of a rear-guard of eighty Somalis. Provisions of all kinds were extremely scarce in the country, so much so, that thirty tins of rice and dates which were brought from England sold at a high price, notwithstanding that they were saturated with salt water, and in a rotten condition. When all the party has assembled at Ngoa ready for a start into the interior, it will consist of more than three hundred men. News of a later date than the above has been received by telegram from Mombasa, in which it is stated that Lieutenant Villiers has joined Sir Gerald Portal's staff, and is now on his way to Uganda.

CENTRAL AND SOUTH AMERICA.

Sir Walter Raleigh's Map of Guiana.*—This map is a facsimile of a manuscript in the British Museum, which has now been published for the first time, the parts blotted or faded having been restored with the aid of Kohl's manuscript copy of the original of Schomburgk's publications of Raleigh's voyage. The map shows the course of the Orinoco and Amazons Rivers, and extends from their mouths to the Pacific coast. The greater part of the north and east coasts is supposed to be from Raleigh's own survey, especially in the neighbourhood of Trinidad; the western portions have probably been taken from Spanish reports. The fictitious Lake Manoa is represented as being about 200 miles in length, with a city at its eastern extremity which

* Sir Walter Raleigh's Karte von Guyana um 1595, von L. Friederichsen. Separatabdruck aus "Festschrift der Hamburgischen Amerika-Feyer 1892."

was reported to be the largest in the world. The construction of the map is the same as that commonly in use during the sixteenth century, and shows rhumb lines, which, in order that they may be more easily distinguished, are coloured black, red and green. In the Hakluyt Society's Publications, 1848, there is the copy of a letter written by Raleigh in the autumn of 1595, which would seem to indicate that he at that time intended to present his map to the Government. In writing to Lord Charles Howard with regard to "The discovery of the large, rich, and beautiful empire of Guaya, &c.," he says:—"How these rivers crosse and encounter, how the cuntries lieth, and is bordered, the passage of Cemenes, and of Berreo, mine own discoverie, and the way that I entred, with all the rest of the nations and rivers, your Lordship shall receive in a large chart or map, which I have not yet finished, and which I shall most humbly pray your Lordship to secret, and not to suffer it to passe your own hands; for by a draught thereof all may bee prevented by other nations. For I know it this very yeere sought by the French, although by the way they now take, I fear it not much." It is supposed that Raleigh did not carry out his intention of sending in his map, and that it was discovered among his papers, when he was arrested a second time, in 1618. The accompanying letterpress contains much interesting matter in connection with the map.

Los Penitentes.—This ("The Penitents") is the name of a picturesque and fantastic group of ice and snow, which forms one of the most remarkable features of the Argentine Cordilleras. It was described by Darwin in 'The Voyage of the *Beagle*,' and he supposed the formation to be due to the manner in which a great mass of snow had partially thawed. Dr. Brakebusch has lately given in *Globus* a new description and an explanation of the origin and formation of the remarkable pillars. In altitudes about 12,000 feet above sea-level extensive icefields are met with of a most peculiar appearance. Out of the dark volcanic ground rise gigantic columns and figures of dazzling white ice and snow, arranged in long parallel lines, and forming thousands of groups which from a distance have a strange similarity to thousands of human beings, standing motionless in the high and lonely valleys of the Cordilleras. When the pale light of the moon shines on the landscape the appearance of these "penitents"—as they are not inappropriately called by the inhabitants of the country—has something of a ghostlike and supernatural grandeur and beauty. Dr. Brakebusch believes that the penitents are the last remnants of glaciers which have been broken up into parallel portions in consequence of internal tension and under the influence of wind and water. These portions having separated into blocks and columns, the wind and sun further contributed to change their appearance and produce the striking forms now found.

The Volcanic Region of Chillan.—Señor Nogués presented to the Société Scientifique du Chili (March 21, 1892) the results of his travels and observations on the physical features of the Andesian volcanoes of Chillan (*Volcan Nevado*, 9526 feet) and surrounding glaciers, confirming the supposition of Pissis (*Geografia fisica de la Republica de Chili*, 1875, Paris) concerning the existence of moraines of two distinct epochs, and therefore of glacial periods, one of them being anterior to the present volcanoes. This accounts for the orography of the region.

Present Commercial Condition of Guatemala.—In a recent Consular report, Mr. Gosling supplies some notes on the present commercial condition of Guatemala. A marked revival has taken place in the trade of the Republic, and during the past five years the imports have been steadily improving. It is estimated that during the year 1891 no less than 52,449,500 lbs. of coffee were exported, roughly valued at £2,477,063. We also learn that the following lines of railroad have been approved of:—A line from the port of Ocos (Pacific) to the village of Santa Catalina, in the department of San Marcos; a line from a station on the Central Railway of Guatemala, called El Navanjo, to the village of Santa Clara, which will open up the primeval forests and stock-raising lands of those districts; a line from La Maquina, also on the Central Railway of Guatemala, and 16 miles from the port of San José, to Santa Lucia and thence to Patulul, altogether 37 miles, which it is thought will again open up the rich coffee and sugar plantations thereabouts. In addition to the above the assembly has adopted a proposition for carrying out the construction of the "Northern Railway," to connect the port of San José, on the Pacific, with Port Barrios, in the Bay of Honduras, a distance of 180 miles. As regards British trade with the Central American Republics, a marked improvement is observable, especially in Costa Rica.

AUSTRALASIA AND PACIFIC ISLANDS.

Physical Geography and Climate of New South Wales.—The New South Wales Government has just published a second edition of Mr. H. C. Russell's pamphlet under this title. New South Wales divides itself naturally into three parts; the eastern Coast District 30 to 150 miles wide, the belt of Mountains and elevated plains 120 to 200 miles in breadth, and the Great Western Plains extending from the mountains towards the Darling River. Mr. Russell describes the physical features of each division, and, after enumerating the principal products, goes on to discuss the climatic conditions. Situated at the southern margin of the trades, the normal winds would be the south-east trade in the northern part of the colony, and the "brave west winds" in the southern, the

former extending further south during summer. The chief cause tending to modify this state of things is, of course, the immense land surface of central Australia, which, during summer, becomes heated to such a degree that, notwithstanding its comparatively low elevation, an indraught of air takes place towards it from all sides. The characteristic wind between the coast and the mountains during summer is, therefore, a kind of exaggerated sea-breeze, which is deflected by the upper current and the mountains from an easterly to a north-easterly wind. Cloud observations show a constant north-west upper current at heights greater than 4000 or 5000 feet, having a velocity of about 80 miles an hour. In the inland districts, light northerly and westerly winds prevail. Temperature means for ninety stations in the colony are given, although the number of years observations on which they are based is not stated. These show in a striking manner the low average and small annual range compared with corresponding northern latitudes, and the slowness of the transition from "coast" to "continental" climate due to the range of mountains. The mean temperature is compared with that of Europe by the novel device of printing the names of stations in New South Wales on a map of Europe beside European towns of the same mean temperature. This is of course not a just comparison of climates unless range as well as mean temperature could be shown. The rainfall statistics are naturally of special importance. In the coast districts the average fall ranges from 45 to 76 inches, along the top of the mountains from 30 to 40 inches, on the western slopes 20 to 30 inches, and on the flat country 10 to 20 inches. The popular reports as to droughts appear to be much exaggerated—the lowest rainfall at Sydney for any two consecutive years amounts to 74 per cent. of the average, a record which can be beaten in this country—and severe droughts are seldom of great extent. The frequent deficiencies in water-supply seem to arise largely from the want of natural means of conserving. Calculation has, however, shown conclusively that the precipitation is greatly in excess of the river drainage, and this has led to the sinking of wells, from which abundance of water has been obtained over the greater part of the inland districts.

POLAR REGIONS.

Proposed Expedition to the North Magnetic Pole.—Colonel Gilder having in 1890 urged the desirability of such an expedition, offering at the same time to take charge of it himself, a committee of the U.S. National Academy of Sciences was appointed to consider the question, and a preliminary report was soon afterwards drawn up. A discussion on the same subject took place in May last before the American Geographical Society, in which some of the leading authorities on terrestrial magnetism took part. The importance of a re-examination of the

region of the North Magnetic Pole as a help towards elucidating the phenomena connected with electricity and magnetism, was insisted on by all the speakers, and the objects to be kept in view by the expedition were clearly laid down. Foremost among these is of course the determination of the precise present position of the Pole, in order to decide whether it has moved since its discovery by Sir James Ross in 1831 on the west side of Boothia. Later observations make it probable that it has shifted some degrees further westward, to a point west of King William Land, somewhere in Victoria Strait; hence the explorer must be prepared to cross that strait and extend his survey to Victoria Land. It was pointed out by Mr. Schott and others, that though observations may not be obtained at the exact position of the Pole, the great desideratum is to secure them at stations *surrounding* that position as near as possible, by which the isoclinic curves of (say) $89^{\circ} 30'$, $89^{\circ} 40'$ and $89^{\circ} 50'$ could be laid down.

M. Rabot's Last Expedition to Jan Mayen and Spitzbergen.—M. Rabot, the well-known traveller in northern latitudes, accomplished, last summer, a voyage to the island of Jan Mayen and Spitzbergen, on board the *Manche*, to which brief allusion was made in the *Proceedings* for November last. The island of Jan Mayen had not been visited since 1882, the date of the Austrian Expedition, and M. Rabot was anxious to explore the freshwater "lakes" of the island. In the summer of 1891 he made an attempt to reach the island, but, when in sight of it, was compelled to retreat before the ice-floes. In order to reach a little lake situated in the centre of the island, M. Rabot and his companion, M. de Blanpré, had to cross a very mountainous tract, intersected by ravines and deep craters. The whole island is volcanic, but shows little signs of activity. The lake in question contains only a little water; it is simply a temporary pool, fed by the melting snow. The traveller also visited the lagoons on both sides of the island; these are not shown on recent Dutch maps, and their formation is apparently recent. The *Manche* subsequently proceeded to Spitzbergen, and a short stay was made at Recherche Bay. The glaciers in this region have retreated considerably. M. Rabot spent some time studying the fossil plants of the district, which are very numerous. Subsequently Ice Fjord was visited, and a short excursion made into the interior. About 19 miles from the coast there is a mountain, rising about 2500 feet above the sea-level, which the traveller ascended, and obtained a fine panoramic view over central Spitzbergen. The whole country was full of wild peaks, small table-lands, and rocky valleys. M. Rabot was struck with the rarity of the glaciers, and concludes that in Spitzbergen the large glaciers are only to be found on the coasts. This region is composed of plateaux of sedimentary origin, and presents a curious aspect, reminding one of the Colorado region of North America. The force of erosion

must have been great since the glacial epoch to have produced the results apparent to-day. Some shells were found at the foot of this mountain, showing that the bay must have at one time extended up to this point. The peak was named Milne Edwards.

The Antarctic Whalers.—A telegram from Monte Video on January 13th brings news of the progress of the Dundee whalers towards the Antarctic regions, and reports that all on board were well. The despatch of the fleet from Dundee in the beginning of September last was noticed in the *Proceedings* for 1892, p. 862. The *Balena*, which was supplied with the most complete equipment for scientific work, reached Port Stanley, in the Falkland Islands, in the end of November. The *Active* arrived on December 8th and the *Diana* on the 11th. The *Polar Star*, which had not instructions to call at Port Stanley, was spoken off the River Plate on November 16th, all well. She reported having had light winds and calms, a state of weather which accounts for the protracted voyage of all the ships. We hope to receive letters giving some account of the preliminary scientific observations in a few weeks, although, of course, it will be several months before the results of the work in the Antarctic ice can be known.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Atlantic Icebergs and the Climate of Europe.—Dr. H. Habenicht, of Gotha, has investigated (*Ausland*, 1892, No. 49) the question whether the climatological changes of Europe are due to cosmical or terrestrial influences. His explanation is in favour of the latter. South of Newfoundland the temperature of the Gulf Stream is influenced by the cold Labrador and Greenland currents, and by the huge icebergs which these currents carry southwards. In different years the number of the icebergs varies greatly, as has been shown for the last nine years in the "U.S. Pilot Charts of the North Atlantic Ocean." It is evident that the melting of these huge icebergs has a considerable influence on the surface-temperature of the Gulf Stream. Habenicht is, therefore, of opinion that the climatological changes of Europe are influenced by the annual number of icebergs which find their way into the Gulf Stream, and he supports his statement by comparing the mean quarterly temperatures of Europe with the fluctuating numbers of icebergs. He estimates the mean velocity of the Gulf Stream in the regions in question to be not more than 10 miles per diem (according to the Prince of Monaco's observations in the northern parts of the Atlantic it is still less). The icebergs reach the Gulf Stream usually between February and July. About six months later their influence on the climate of Europe becomes perceptible, and extends from

this time over a period of considerable length, as the following table shows:—

QUARTERLY MEAN CLIMATE OF EUROPE.

Years.	Number of icebergs reported in the Gulf Stream in spring and summer of first-named year.	Winter, Dec. to Feb.	Spring, March to May.	Summer, June to Aug.	Autumn, Sept. to Nov.
1886-87	60	moderate	cold	moderate	cool
1887-88	220	moderate	cold	cold	cold
1888-89	10	mild	warm	warm	warm
1889-90	28	mild	warm	cool and rainy	mild, towards the end cold
1890-91	674	very cold	very cold	cold	warm
1891-92	141	moderate	cool	warm and very dry	warm

It cannot be denied that the coincidences are striking, and that we probably have here before us one of the factors which influence the climatological changes of Europe.

A new Observatory in Trans-Caucasia.—At the beginning of last autumn an astronomical observatory was opened at Abbas-Tuman ($41^{\circ} 46'$ lat. and $60^{\circ} 32'$ long.) in the province of Kutais. It is situated at an altitude of 4236 feet above the sea-level. The cost of its erection has been defrayed by the Grand Duke Georges Mikhaïlovich, and the management has been entrusted provisionally to Mr. Glazénap.

The Inconstancy of Latitude.—Dr. A. Marcuse read a report upon the geodetic expedition to the Hawaii Islands at the meeting of the Berlin Geographical Society, on December 3rd, 1892. Theoretical investigations have long ago given rise to the hypothesis of changes of latitudes. The first observational data with regard to a constant change in latitudes were obtained by Professor F. Küstner, who, from his observations at the Berlin Observatory, showed that the latitude of Berlin in the spring of the year 1882 was about two-tenths of a second less than at the same time of the year 1881. Similar results were derived from the observations at the Observatories of Pulkova and Gotha. In September, 1888, therefore, the Conference of the Permanent International Geodetic Commission, which was held at Salzburg, determined to undertake an investigation of this important question by means of simultaneous observations at the Observatories of Berlin, Potsdam, Prague, and Strasburg, which were commenced in January, 1889, and continued until April, 1890. The result of these observations was to show that in fact the latitudes of the places named were subject to periodical changes, the maxima of which occurred during the autumn, and the minima during the spring-time. The greatest variation

amounted to about one-half of a second, or in linear measure about 51 feet. Variations of this extent could not be neglected in accurate geodetical measurements where the calculations are often worked out to a few hundredths of a second. Theoretically, there are three possible reasons for variations in latitudes, viz., changes of gravity or of the plumb-line, the still unknown vibratory movements of the Earth's axis, and, lastly, variations in the position of the Earth's rotation-axis in the mass of the Earth itself. For the determination of this question it is necessary to have corresponding observations for latitude at two stations as nearly as possible 180° distant from each other. In case it should be, as in fact did happen, that the variation of latitude takes place simultaneously, but in an opposite sense, the third explanation is the only one possible. The Permanent Commission for Earth-Measurement determined, therefore, in January, 1891, to despatch an astronomical expedition to Honolulu for the purpose of taking observations for latitude as accurately as possible, simultaneously with observations at the Observatories of Berlin, Prague, and Strasburg. The expedition left Berlin on April 1st, 1891, and at Washington was joined by Mr. Preston, an officer of the Coast and Geodetic Survey of the United States. From the end of May, 1891, to May 1892, Dr. Marcuse recorded 1800 observations for latitude, with the result that if for Germany the geographical latitude increases, it decreases on the ante-meridian to exactly the same extent; thus furnishing an incontrovertible proof that the variations of latitude are caused by changes in the Earth's rotation-axis. The greatest possible precautions were taken to insure the accuracy of the measurements. The station was situated on a coral-rock on the sea-coast; the observation hut was specially constructed with double walls to keep off the intense rays of the sun, and, in order to guard against irregular refraction and the influence of temperature on the zenith telescope, the electric light was used for reading the instruments.

GENERAL.

Hannibal's Vinegar.—The recent revival, by Sir George Bowen, in the columns of the *Times*, of the old conjectural reading of *acuto*, "with a pick," in place of *aceto*, "with an acid," in Livy's account of Hannibal's difficulties in the passage of the Alps, furnishes an occasion for quoting from M. Lenthéric's recent work on the Rhône (Paris, Plon, 1892) an adequate and conclusive answer to the long array of critics who have superfluously striven to prove that Livy was writing at random, or wrote something else than the received text. M. Lenthéric writes (vol. i. pp. 89-91), "Some commentators, anxious to reconcile the text of Livy with their prejudices against an incident they regard as fabulous, have found nothing better than to alter the text itself and to replace the word *aceto* by the conjecture *acuto*; in this case *acutum* would simply indicate the sharp instrument which had served to penetrate the quartz or hard limestone of the Alps. Other critics—and these are the majority—have solemnly reproached Livy for having here as elsewhere written for effect, for having yielded to a desire to preserve a popular legend, to please the imagination of his readers and render his narrative more picturesque by enlivening it with a romantic fable, for having failed, in short, in that literary veracity which should be the characteristic of the historian. Modern science has taken up the

question anew, and unluckily for the critics, the pretended 'fable' of fire and vinegar can now be discussed with knowledge. As a matter of fact, it proves that the greater part of the classical writers who have touched on the famous passage of the Alps, have spoken of the simultaneous action of fire, cold water, and an acid. Further, the action of fire and water on rocks has been known from all time, and is pointed out by many ancient authors. Limestone is decomposed by the action of fire alone and changed into quicklime, which water dissolves very easily. Siliceous rock is not decomposed by fire—it splits either under fire or the subsequent effect of cold water. Fires are lighted round, or on the ledges of, the rock; as soon as the rock is sufficiently heated, cold water is poured in channels prepared beforehand so as to produce regular cleavages. It is exactly the practical application of the line of Lucretius—

"*Dissiliuntque fero ferventia saxa vapore.*"

"Almost any liquid may replace water. Vinegar, *acetum*, or more generally acids, exercise a chemical action which did not escape the ancients. On this point the texts are precise. Pliny says of vinegar (*Hist. Nat. i. xxiii., xxvii.*), '*Saxa rumpit infusum quæ non ruperit ignis antecessens*'; (*i. xxxiii., xxi.*), '*Silices igne et aceto rumpunt.*' Vitruvius (*viii. c. 3*) adds, '*non minus saxa silicea quæ neque ferrum neque ignis potest per se dissolvere cum ab igne sunt percalefacta aceto sparso dissiliunt et dissolvuntur.*' Dion Cassius may also be quoted (*i. xxxv.*): '*The city (Meleuthera, in Crete) was taken by treason, and held to ransom. The traitors saturated by night with vinegar a great tower with smooth surfaces, so as to render it friable.*' These passages are conclusive, and place beyond doubt that it was the practice of the ancients, in order to break stone surfaces, to employ acids or saline solutions, the chemical effects of which they had observed, though they were probably unable to explain them. What was the exact nature of the liquid employed by Hannibal it is for chemistry to elucidate. Whatever it may have been, the old story of the classical historian which has met with so much incredulity among scholars and historians, is in accordance with the common practice of the age, as attested by adequate authority."

The part played by Mountains in the Distribution of Races.—M. Félix Regnault recently read a paper before the Paris Society of Anthropology, having been led to study the influence of mountains on races from observations made during a journey in India. In the case of a range sufficiently elevated and continuous to be a factor in the distribution of races, and where other causes do not intervene, he thinks that the following laws hold:—(1) The crest of a range never separates two races (apparent exceptions are due to the fact that states consider it necessary to occupy the slopes facing their respective territories for

defensive purposes); (2) where, as is usually the case, the slope is gradual on one side and steep on the other, the race on the side of the gradual slope surmounts the crest and occupies the steep slope also. M. Regnault gives many examples of this drawn from the ranges of Europe and Asia, *e.g.*, the French and German races in great part descend to the Italian foot of the Alps; the reason he gives is, the greater facility for gradual acclimatisation enjoyed by the dwellers at the foot of the gradual slope. In some of the instances brought forward, he could only point to a difference between the races of mountains and the plains at their foot, which he ascribes to difference of environment; while in the discussion which followed some speakers were inclined to lay more stress on the driving back to the mountains of inferior by superior races, as an explanation of certain phenomena of distribution, and took exception to the laws enunciated as being to any large extent generally applicable.

Two predecessors of Varenus.—Bernhard Varenus, author of that celebrated work '*Geographia generalis*,' Amsterdam, 1650, has hitherto been regarded as the first to clearly define the difference between general and special geography. But A. Philippson, of Bonn, has now proved (*Ausland*, 1892, No. 52) that prior to Varenus, the works of Paul Merula ('*Cosmographia generalis et Geographia particularis*,' Amsterdam, 1636) and of David Christiani ('*Systema Geographiæ generalis*,' Marburg, 1645), contained the definitions and distinctions of general and of special geography. The former of these two writers deals with the hydrography and ethnography of our planet, with its dimensions, with the divisions and zones of its surface, and explains the most important definitions of general geography. Christiani makes a clear distinction between geography and chorography, and deals with mathematical geography, anemography (winds, etc.), and hydrography. As regards their cosmological views, it is interesting to note that both Merula and Christiani are opposed to the Copernican system.

Columbus as a Cosmographer.—At the Geographical Society of Berlin, on October 8th, 1892, Dr. K. Kretschmer read a paper on Christopher Columbus as a cosmographer, in the course of which he laid special emphasis on the fact that the great discoverer, down to the end of his life, did not come to understand the real significance of his discoveries, but always cherished the belief that he had discovered parts of Asia. This belief is conspicuous in all his letters and other writings, and he was unremitting in the trouble he took to obtain fresh evidence in support of this opinion. Like his contemporaries, he was little able to measure the far-reaching significance of his explorations. To discover India was his supreme desire, and every consideration which was urged against his views caused him the most bitter mortification, and was regarded by him as a direct personal affront.

CORRESPONDENCE.

The Nomenclature of the Karakoram Peaks.

SHALFORD PARK, GUILDFORD.

Jan. 6th, 1893.

SIR,—When reading the Geographical Notes in the December number of the *Proceedings* of the Geographical Society, 1892, my attention has been called to an extract from one of Mr. Conway's letters, headed "The Nomenclature of the Karakoram Peaks." It is to be regretted that so much reliance and importance has been placed on what a native drew on the sand, and the names he gave to various peaks. Natives are not always to be depended upon, not even when the topographical features are within the range of vision, and unless verified from other and independent information, names thus obtained cannot be trusted and placed on record, so well exemplified in this instance. The traveller must also have a considerable knowledge of the native languages, or he may be very much misled. It may not be too late to prevent these names thus put forward from being accepted by geographers, for fortunately I know both places well.

"Skeenmang" or "Skinmang," *vide* Engraved Atlas Sheet 44 A. N. W., is the name of a rather level piece of somewhat grassy ground at the great bifurcation of the Punmah Glacier; the name itself is expressive, and is derived from "Skeen," an ibex, and "Mang," a level open space in Balti.—"Marg" in Kashmiri, "maidan" in Hindustani, which disposes of it as a possible name for a peak.

Next we have "Chiring" put forward as the native name of K², quite as inaccurate as the above. It is the name of another halting-spot at the end of a spur about half-way between Skeenmang and the Mustakh pass, as used about the period I was there (1860); it is situated above a very narrow part of the glacier, where its action on the sides is most apparent. ("Chirna," Hindustani, is to rend or tear.) All that portion of the glacier above this place, extending for six miles to the main watersheds, is called the "Chiring Ganse."

With regard to the remark on the differences to be found between the Government of India Survey Sheets, and the map published by the R.G.S., 1864, the latter was compiled from a photograph copy on same scale of my original Plane Table Survey; it very likely shows better in parts the peaks fixed by me, than the method of delineating the mountain ridges and spurs in the engraved sheets. Some features are sure to be lost in copying, and it must be borne in mind the copy of my original work, and lastly, that done by the engraver, were executed by men who had never seen the ground.

I am, sir,

Your obedient servant,

H. H. GODWIN-AUSTEN, Lt-Col.

To, The Editor of the *Geographical Journal*.

[In my brief letter, printed in the December number of the Royal Geographical Society's *Proceedings*, I reported an exact statement, taken down by Mr. Eckenstein from the lips of a native, and explained by a rough map drawn upon the ground by him, to the effect that Chiring is the native name of K², and Skinmang of the great peak immediately east of Captain Younghusband's Mustagh Pass. Colonel Godwin-Austen replies that these are the names of camping-grounds on the route

to his own Mustagh Pass, a fact of which I was aware, for they are marked on the map and referred to in his interesting paper, which I carried with me and frequently read. The route to that pass was also known to the native in question, and marked by him on his own rough map; but he put forward the names as those of peaks, and he also said (as I was informed) that these peaks were higher than Masherbrum, though which of the two was the highest he did not decide. He inclined to think Skinmang higher than Chiring. The fact that these names are also given or belong properly to pastures or camping-grounds is no sort of objection to their being also attached to peaks; in fact such a transfer of a name from pasture to peak is more of a rule than an exception. There is a Chiring pasture in the Dainyor Valley near Gilgit, and the outlier of Rakipushi above it is called by the same name. Mango* is the designation of a pasture about 10 miles up the right bank of the Biafo Glacier; it is also the name of the high peak opposite the foot of that glacier. The people of Askoley call it simply Mango; I could find none (out of some hundred I inquired of) that knew it as Mango Guzor, though that may nevertheless be its full name, as Chiring something may be the full name of K². The whole question of the naming of peaks has been fully discussed by Mr. Freshfield in the Royal Geographical Society's *Proceedings* of March 1886. The common course, both in the Alps and the Caucasus, has been for a name to be moved up from village, stream, or pasture, to a peak above. Thus from Matt (= meadow) we have Matterjoch, Matterhorn, and the like. Finsteraarhorn, Rheinwaldhorn, Saasgrat, Viescherhörner, Buet (Bovet, pasture, according to De Luc), are other Alpine examples. The map-maker as a rule adds the *mont* or *horn* to the old name. In the Caucasus the Russian surveyors call the peak over the Dych su (stream) Dych-tau, the peak above the Koshtan Glen (Kosh = chalet) Koshtantau, and so on. In the Bagrot Valley the natives told me that the name of a pasture belonged always to the height above it. If pressed they would add a particular designation. Thus Bari Rung is the Bari pasture, Bari Chish is the mountain above the pasture, but both were as a rule called simply Bari. I am sorry that, in maintaining the views I have always publicly upheld as to the proper system of mountain nomenclature, I am obliged to go counter to Colonel Godwin-Austen in a particular instance in which he is personally interested. He will, I think, understand that I am in no way wanting in appreciation of the extent and excellence of the work done by him under very difficult conditions in the Karakoram Range. The object of my journey was in fact to carry on that work in some parts and to complete it in others.—W. M. CONWAY.]

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1892-93.

Fifth Ordinary Meeting, January 16th, 1893.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., President, in the Chair.

ELECTIONS.—*Robert Downs* (accidentally omitted from November list); *Charles Horace Andrews*; *George Lord Beeforth, J.P.*; *John Charles Blake*; *Alfred Clay*; *W. M. Conway, M.A.*; *Basil Bentham Dickinson*; *Commander F. G. Dundas, R.N.*; *Frank M. Dutton*; *Thomas Henry Evans*; *John Hadden Fisher, B.C.S.* (retired);

* See derivation of this word in Colonel Godwin-Austen's letter above.

Joseph Franken; Raymond Godfrey; Shrimant Sampatrao K. Gaikwad; Matthew Wilks Geary; Albert Bruce Joy; Robert T. Hicks; Captain William Clive Hussey, R.E.; F. J. Jackson; A. J. Mounteney Jephson; George J. Kent; A. H. Savage Landor; Mrs. MacLennan; G. E. Marindin; Evelyn John Marsdon; James A. Marshall; Alfred Fairfax Morgan; Staff-Commander E. O. Dubois Phillips, R.N.; James Robert Phillips; Alfred Raphael; Henry Alexander Sim; Frederick Smallman; James McLaren Smith, B.A.; Theodore Martin Teed, C.E.; Lieut.-Colonel N. L. Walford, R.A.; Major W. H. Waters, R.A.

The paper read was:—

"Journeys in Sarawak, Borneo." By Charles Hose.

There was an exhibition of photographs, manufactures, weapons, musical instruments, etc., in the tea-room.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

EUROPE.

Alps. *Tour du Monde* 64 (1892): 417-432. **Durier.**

La Catastrophe de Saint-Gervais-les-Bains. Par M. Charles Durier.

An authoritative account of the nature and cause of the catastrophe which destroyed the houses of St Gervais on July 12th, 1892, written by the vice-president of the French Alpine Club, and illustrated from photographs.

Alps and Apennines. *Bol. Soc. Geog. Italiana* 5 (1892): 946-964. **Marinelli.**

Sulla linea di divisione, da adottarsi nell'insegnamento, tra le Alpi e gli Appennini. Relazione del Prof. G. Marinelli.

Apennines. *Globus* 62 (1892): 242-245, 264-267, 361-365. **Deecke.**

Der Appenin an der Irpinischen Wasserscheide nach seiner physischen Beschaffenheit und ökonomischen Bedeutung. Von W. Deecke, Greifswald. With map.

Danube. **Millet.**

The Danube from the Black Forest to the Black Sea. By F. D. Millet. London, Osgood, McIlvaine & Co., 1892: 8vo, pp. xii. and 327. Illustrations. Price 10s. 6d.

An illustrated account of a canoe trip down the Danube, with bright comments on the places, scenery and types of people met with.

England—Norfolk Broads. *Natural Science* 1 (1892): 347-355. **Gregory.**

The Physical Features of the Norfolk Broads. By J. W. Gregory, B.Sc.

A piece of sound local geography, illustrated by sketch maps and a photograph of characteristic scenery.

England—Yorkshire. **Leyland.**

The Yorkshire Coast and the Cleveland Hills and Dales. By John Leyland. With illustrations by Alfred Dawson and Lancelot Speed. London, Seeley & Co., 1892: 8vo, pp. 334. Price 7s. 6d.

Mr. Leyland has founded his picturesque historical account of Eastern Yorkshire firmly upon the geology and configuration of the district, showing full appreciation of the geographical principles which give unity and proportion to such a description.

Europe.**Block.**

L'Europe politique et sociale par Maurice Block. Deuxième édition, ouvrage entièrement nouveau. Paris, Hachette et Cie., 1892: 8vo, pp. viii. and 586. *Maps. Price 10s.*

M. Block deals with the relative social conditions of the various European nations on a well-ordered plan, and fortifies his position with the necessary statistics. The Political conditions come first, viewed with regard to Organisation, Territory and population and Finance. Then the Economic conditions, including Agriculture, Industry, Commerce, and Means of Communication; and finally the Social conditions to which most detail is given, this section occupying half the book. Wherever it is possible the comparative statistics are presented diagrammatically and on maps, and the discussion is always clear and to the point. In the widest sense this may be looked on as a treatise on what is vaguely known in this country as the "commercial geography" of Europe.

France.—Arcachon.*Tour du Monde* 64 (1892): 353-384.**Kauffmann.**

Dans la Forêt d'Arcachon. Par M. P. Kauffmann.

An account of the mode of utilising the *landes*, with sketches of forest life.

Germany.—Baden.**Neumann.**

Die Volksdichte im Grossherzogtum Baden. Eine anthropogeographische Untersuchung. Von Dr. Ludwig Neumann, Professor der Geographie an der Universität Freiburg. Stuttgart, Engelhorn, 1892: 8vo, pp. 172. *Price 9s. 6d. With two maps.*

Part I. of Vol. VII. of Kirchhoff's *Forschungen zur Deutschen Landes- und Volkskunde*.

Germany.—Saxony.**Simon.**

Die Verkehrsstrassen in Sachsen und ihr Einfluss auf die Städteentwicklung bis zum Jahre 1500 von Dr. A. Simon, Seminarlehrer in Auerbach. Stuttgart, Engelhorn: 8vo, pp. 99. *Price 4s.*

Part II. of Vol. VII. of Kirchhoff's series.

Greece.**Diehl.**

Excursions in Greece to Recently-Explored Sites of Classical Interest: Mycenae, Tiryns, Dodona, Delos, Athens, Olympia, Eleusis, Epidaurus, Tanagra. A popular account of the results of recent excavations. By Charles Diehl. Translated by Emma R. Perkins. With an Introduction by Reginald Stuart Poole, LL.D. London, Grevel & Co., 1893: 8vo, pp. xxiv. and 408. *Price 7s. 6d. Presented by the Publishers.*

An admirable summary for visitors to Greece who wish to acquaint themselves with historic and prehistoric sites, without the laborious study of archaeological works.

Holland.—The Zuiderzee.*Globus* 63 (1893): 6-10.**Hansen.**

Die Trockenlegung der Zuiderzee. Von Dr. R. Hansen. *With map.*

Montenegro.*Deutsche Rundschau* 15 (1893): 97-106, 166-173.**Hassert.**

Eine Fusswanderung durch Montenegro. Von Dr. K. Hassert. *Map and illustrations.*

Norway.**Reusch.**

Bömmeløen og Karmøen med omgivende geologisk beskrevne af dr. Hans Reusch. Kristiania Steensballe, 1888: 4to, pp. 422. *Maps and plates.*

An account of the geology of the islands at the mouth of the Hardanger Fjord, the study of which has thrown much light on the origin of metamorphic rocks. The book is provided with an English summary of the contents.

Rhone.**Lentheric.**

Le Rhone, Histoire d'un fleuve. Par Charles Lentheric, Ingénieur en chef des ponts et chaussées. Paris, Plon, Nourrit et Cie., 1892: 2 vols., pp. I. viii. and 557, II. 585. *Price 15s.*

The author disclaims any intention of writing a treatise for specialists, but he has produced a most comprehensive description in popular form of the history of the River Rhone. While necessarily adopting some debatable theories as if they were

proved, his method has the advantage of giving in a continuous narrative the main features of the Rhone Valley prior to, during and since the Glacial Period. Physical and human interest are interwoven, a chapter on the ancient roads connected with the valley, leading to an account of the Rhone and its surroundings during historical times, and of the peoples who lived in or passed through its valleys. The concluding chapter deals with the modern river in its physical and practical aspects.

Rumania. *Bul. Statist. Gen. Romaniei* I. (1892): 1-200.

Asupra Populatiei Romaniei.

A full discussion of the number and nature of the population of Rumania from 1849 to 1890.

Scotland.

Annandale.

Scotland in Prehistoric Times: a brief summary of what is known regarding the country and its inhabitants in times anterior to the Roman invasion. Based on the most recent researches. By Charles Annandale, M.A., LL.D. London, Blackie & Son, 1892: large 8vo, pp. 38. *Illustrations. Presented by the Publishers.*

The introductory chapter to 'A History of the Scottish People from the Earliest Times' (shortly to be issued), by the Rev. Thomas Thomson.

Spain, Dictionary of.

Castillo.

Gran Diccionario Geográfico, estadístico é histórico de España y sus Provincias de Cuba, Puerto Rico, Filipinas y posesiones de África. Esta obra se publica bajo la dirección de D. Rafael del Castillo. Tomo III. [Mon-Sat.] Barcelona, 1891: 4to, pp. 715. *Map.*

Switzerland.

Graf.

Cartes de Parcelles plus ou moins grandes du territoire suisse. Publié par le Bureau Topographique Federal. Rédigé par le Prof. Dr. J. H. Graf. Berne, Wyss, 1892: 8vo, pp. 171-335. Price 3s. *Presented by the Publisher.*

The second part of the valuable official bibliography of works relating to Switzerland.

Turkey—Mount Athos. *Jahresbericht Geog. Ges. München* 14 (1890-91): 75. **Dühmig.**
Der Berg Athos. Von Karl Dühmig.

General description of the Chalkidike, and narrative of a visit to Mount Athos.

ASIA.

India.

Führer.

The Monumental Antiquities and Inscriptions in the North-Western Provinces and Oudh. Described and arranged by A. Führer, Ph.D. (Archaeological Survey of India). Allahabad, 1891: large 4to, pp. iv. and 425. *Presented by the Secretary of State for India.*

Classified lists of monumental inscriptions and antiquities.

India.

Le Bon.

Les Monuments de l'Inde. Par le Dr. Gustave Le Bon, chargée d'une mission archéologique dans l'Inde par le Ministre de l'Instruction publique. Ouvrage illustré d'environ 400 figures; héliotypies, dessins, cartes et plans exécutées après les photographies et les documents de l'auteur. Paris, Firman-Didot et Cie., 1893: large 4to, pp. (text) 254. Price 100s.

Indo-China. *Bull. Soc. Geog. Paris* 13 (1892): 216-249, 339-374.

Aymonier.

Une mission en Indo-Chine (Relation sommaire). Par Etienne Aymonier.

Kashmir.

Duke.

Ince's Kashmir Handbook: a Guide for Visitors. Rewritten and much enlarged. By Joshua Duke. Calcutta: Thacker, Spink & Co., 1888: 12mo, pp. 337. *Maps.* Price Rs. 6.

Appendix to Ince's Guide to Kashmir. Rawal Pindi to Srinagar: a detailed account of the new Jhelum Valley road. Together with a brief Note of five other routes leading into the valley. Calcutta, Thacker, Spink & Co., 1892: 12mo, pp. 84. Price R. 1, 8. *Presented by the Publishers.*

Worthy to rank with Bœdeker's European guide-books for full information, conciseness, and clear arrangement. The maps are of special value.

- Oxus.** *Bull. Soc. Geog. Paris* 13 (1892): 281-315. **Blanc.**
L'Hydrographie du bassin de l'ancien Oxus. Par Edouard Blanc.
With map.

The collection of ancient maps of Asia, shown at the Moscow Exhibition of 1892, is here utilised along with other data and the author's personal explorations.

- Pamirs.** *Bull. Soc. Geog. Paris* 13 (1892): 316-338. **Capus.**
Observations et notes météorologiques sur l'Asie centrale, et notamment les Pamirs. Par Guillaume Capus. With map.

- Persia—Susa.** **Dieulafoy.**
 Marcel Dieulafoy. *L'Aerropole de Suse d'après les fouilles exécutées en 1884, 1885, 1886, sous les auspices du Musée du Louvre. Ouvrage contenant 386 gravures insérées dans le texte avec 4 planches en noir et 12 planches en couleurs. Paris, Hachette et Cie., 1893: large 4to, pp. 448. Price 80s.*

This magnificent work will be specially reviewed.

- Siam—Bangkok.**
The Directory for Bangkok and Siam for 1892. London, F. Algar; Singapore, Sayle & Co.: sm. 4to, pp. iii, 334, and 32. Presented by the Compiler.
 A plan of Bangkok is given, showing the roads, canals, and chief buildings.
- Sumatra.** *Bijdrag. Volkenkunde Nederl.-Indie* 7 (1892): 609-621. **Bevervoorde.**
Een Bezoek aan de Bataksche Hoogvlakte. Door K. Th. Engelbert van Bevervoorde.

An account of the Battak Tableland in Northern Sumatra.

- Sumatra.** *Bijdrag. Volkenkunde Nederl.-Indie* 7 (1892): 330-623. **Kielstra.**
Sumatra's Westkust sedert 1850. Door E. B. Kielstra.

History of the exploration and development of the west coast of Sumatra from 1850 to 1890.

- Syria.** *Miss. Catholiques* (1892): 382, 395, 419, 432, 439, 457, 468, 482, 492, **Jullien.**
 505, 515, 537, 562, 577, 588, 596, 610, 621, 647.
Voyage dans la Syrie Septentrionale aux ruines chrétiennes des IV^e, V^e, et VI^e siècles. Par le R. P. Jullien.

Illustrated by some good pictures of early Christian architecture.

AFRICA.

- Africa.** **Brown.**
The Story of Africa and its Explorers. By Robert Brown, Ph.D. Vol. I.—The Guinea Traders; The Corsairs of Africa; The Tale of Timbuctoo; The Niger. London, &c., Cassell & Co., 1892: 4to, pp. viii. and 312. Illustrations. Price 7s. 6d. Presented by the Publishers.

This work is issued in monthly parts. Part I. was noticed in the *Proceedings* for 1892, at p. 269. It is a good, popular account of the subjects dealt with, with excellent illustrations.

- East Africa.** **Mandat-Grancey.**
Souvenirs de la Côte d'Afrique. Madagascar—Saint-Barnabé. Par le Baron E. de Mandat-Grancey. Paris, E. Plon, Nourrit & Co., 1892: 12mo, pp. 308. Illustrations.

- Egyptian Sudan.** **Chailié-Long.**
L'Égypte et ses provinces perdues. Par le Colonel Chailié-Long Bey. Paris, Librairie de la Nouvelle Revue, 1892: 8vo, pp. 327. Price 3 fr. 50 c.

Contains some remarkable adventures of the author while acting as a subordinate of Gordon in the Equatorial province, and in command of an expedition to the Jub.

- German East Africa.** *Mitt. Deutschen Schutzgebieten* 5 (1892): 191-203. **Herrmann.**
Ugogo, das Land und seiner Bewohner. Von Lieutenant Herrmann.

German East Africa. *Mitt. Deutschen Schutzgebieten* 5 (1892): 101-134. **Stuhlmann.**
[A series of short papers, with a map illustrating Dr. Stuhlmann's travels between Tabora and the Victoria Nyanza in 1890.]

German East Africa. **Schmidt.**

Geschichte des Araberaufstandes in Ost-Afrika. Seine Entstehung, seine Niederwerfung und seine Folgen. Von Rochus Schmidt. Frankfurt a. Oder, Trowitzsch & Son [1892]: 8vo, pp. 360. Map. Price 4s. 6d.

German West Africa. *Mitt. Deutschen Schutzgebieten* 5 (1892): 211-242. **Danckelmann.**
Weitere Beiträge zur Klimatologie des Schutzgebietes von Kamerun. Von Dr. von Danckelmann.

Tables and discussion of the meteorological observations made in the Kameruns during the last three years.

German West Africa—Kamerun.

Morgen.

Durch Kamerun von Süd nach Nord. Reisen und Forschungen im Hinterlande 1889 bis 1891. Von C. Morgen. Leipzig, Brockhaus, 1893: 8vo, pp. 390. Price 8s. 6d. Map and illustrations.

Lieutenant Morgen's route led inland from Kribi, northward through the Ngaundere country and Adamawa to Ibi on the Benue, whence he returned by that river and the Niger. His journey is described with the aid of numerous excellent illustrations, and there are appendices on the meteorology of the Kameruns, on the imports and exports of that colony, and on the new German rules for phonetically rendering names.

North-east Africa.

Fumagalli.

Bibliografia Etiopica. Catalogo descrittivo e ragionato degli scritti pubblicati dalla invenzione della stampa fino a tutto il 1891 intorno alla Etiopia e regione limitrofe. Redatto da Giuseppe Fumagalli. Milano, U. Hoepli, 1893: 8vo, pp. xi. and 288. Price 9s.

A classified catalogue of nearly three thousand works dealing with the regions of north-eastern Africa where Italian interests are predominant, compiled by the Librarian of the National Library of Milan.

Sahara.

Bull. Soc. Geog. Paris 13 (1892): 375-392.

Fabert.

Voyage dans le pays des Trarzas, et dans le Sahara occidental. Par Léon Fabert. With map.

An abstract was given in the *Proceedings* for 1892, p. 338.

Sudan.

Proc. Roy. Artillery Inst. 19 (1892): 675-694.

Wingate.

The Sudan, Past and Present. By Major F. R. Wingate, D.S.O., B.A.

Zimbabwe.

Pet. Mitt. 38 (1892): 283-286.

Schlichter.

Die Ruinen von Simbabwe. Von Dr. Heinrich G. Schlichter.
A discussion of the orientation and age of the ruins.

NORTH AMERICA.

United States—Arid Region.

Redway.

The Influence of Rainfall on Commercial Development: a Study of the Arid Region. By Jacques W. Redway: 8vo, pp. 14. Reprinted from the 'Proceedings' of the Engineers' Club of Philadelphia, October 1892. Presented by the Author.

Vinland.

Power.

The Whereabouts of Vinland. By Hon. L. G. Power, Halifax, N.S.: 4to, pp. [19]. Illustrations. From the 'New England Magazine' for Oct. 1892.

The site of Leif Erikson's house is supposed by Mr. Power to have been on Hamilton's Inlet, in Labrador, and arguments in support are brought forward.

CENTRAL AND SOUTH AMERICA.

Amazons.

Bates.

The Naturalist on the River Amazons. By Henry Walter Bates, F.R.S. With a memoir of the author by Edward Clodd. London, John Murray,

1892: 8vo, pp. lxxxix. and 395. *Maps and illustrations. Presented by the Publisher.*

A reprint in one volume of the unabridged first edition of this masterpiece of scientific travel. Since its first publication thirty years ago the book has been accepted as a classic, and nothing farther can now be said save in the way of hearty welcome in its new form. A brief but deeply appreciative memoir of the author is prefixed, and Mr. Clodd has incorporated with it a number of letters of great permanent value which illustrate the rise and progress of the friendship which bound Bates to Darwin, Hooker, and other leaders of biological science. We cannot but regret, however, the somewhat unhappy portrait, the pained expression of which contrasts unfavourably with that in the photograph published in the *Proceedings* for May, 1892.

Andes. *Globus* 63 (1893): 1-6, 32-35. **Brackebusch.**

Die Penitentesfelder der argentinischen Cordilleren. Von Prof. Dr. Ludwig Brackebusch. *Illustrations.*

A summary of this paper appears elsewhere.

Brazil. **Ehrenreich.**

Beiträge zur Völkerkunde Brasiliens. Von Dr. P. Ehrenreich. Berlin, Spemann, 1891: fo, pp. 80. *Plates. Presented by the Königlichen Museum für Völkerkunde at Berlin.*

This issue includes an account of the Karaya people of the Rio Araguaya, and of some of the people of the Rio Purus, copiously illustrated with photographs and woodcuts.

Brazil—San Paulo. *Pet. Mitt.* 38 (1892): 273-283. **Lange.**

Aus dem Staate São Paulo, Brasilien. Von Prof. Dr. Henry Lange. *Maps.*

An account of the recent work of the Geographical and Geological Commission.

Central American names. **Pector.**

Considérations sur quelques Noms Indigènes de localités de l'Isthme Centre-Américain, par Désiré Pector. Paris, E. Leroux, 1892: large 8vo, pp. 23. *Presented by the Author.*

Costa Rica. *Annales Inst. Fisico-geog. Costa Rica* 3 (1892): 57-106. **Pittier.**

Viaje de Exploracion al Valle del Rio Grande de Terraba. Por H. Pittier.

Narrative of Dr. Pittier's scientific exploring journey in 1891, with an orographical map of Costa Rica.

Haiti. **Tippenhauer.**

Die Insel Haiti. Von L. Gentil Tippenhauer. Leipzig, Brockhaus, 1893: fo, pp. xviii. and 693. *Maps and plates. Price 34s.*

An authoritative work which will be specially reviewed.

Nicaragua. **Pector.**

Congrès International des Sciences Géographiques tenu à Paris en 1889. Exposé sommaire des voyages et travaux géographiques au Nicaragua dans le cours du XIX^e siècle, par Désiré Pector. Paris, Bibl. des *Annales Économiques*, 1891: large 8vo, pp. 8. *Presented by the Author.*

Tierra del Fuego. **Hyades and Deniker.**

Mission scientifique de Cap Horn 1882-1883. Tome VII., Anthropologie, Ethnographie. P. Hyades, J. Deniker. Paris, Gauthier-Villars et Fils, 1891: 4to, pp. viii. and 424. *Map and plates.*

This volume closes the records of the French Scientific Mission to Cape Horn with a careful study of the tribes inhabiting the dreary Archipelago of Tierra del Fuego. There are admirable photographic illustrations.

Venezuela. **Bolet-Paraza.**

The Republic of Venezuela. By Don Nicanor Bolet-Paraza. 4to, pp. [15]. *Illustrations. From 'The New England Magazine,' October 1892.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia.

Lendenfeld.

Australische Reise von R. v. Lendenfeld. Innsbruck: Verlag der Wagner-schen Universitäts Buchhandlung. 1892: large 8vo, pp. ix. and 325. *Prices* 8s. 6d. *Illustrations*.

A general description of the physical features and natural productions of Australia and New Zealand. The views of the New Zealand glaciers and snow-peaks are magnificently reproduced, and the account of Antipodean mountaineering, including the first ascent of the Hochstetter Dome, is authoritative and full of interest.

New South Wales.

Russell.

Physical Geography and Climate of New South Wales. By H. C. Russell, F.R.S. Second edition. Sydney, Charles Potter, 1892: 8vo, pp. 35, *maps*. *Presented by the Government of New South Wales*.

Queensland—Magnetic Island.

Maitland.

The Physical Geology of Magnetic Island (Report by A. Gibb Maitland, Assistant Government Geologist, with two geological maps and two plates of sections), 1892: fo, pp. 8. *Presented by the Government of Queensland*.

This island was named by Cook in 1770 on account of the remarkable deflection of the compass observed on approaching it. The Report, which is an interesting contribution to the work begun by Rücker and Thorpe in this country, makes it evident that the magnetic effects are due to the exceptional number of basic volcanic dykes containing magnetite, a mineral which is also abundant in the sand on the beach.

Solomon Islands.

Globe 63 (1893): 41-43, 62-66.

Seidel.

Die Salomo-Insel Malaita. Von H. Seidel. *Maps and illustrations*.

A compilation likely to be useful on account of the number of authorities cited.

POLAR REGIONS.

North Greenland.

Heilprin.

The Peary Relief Expedition. By Angelo Heilprin. 4to, pp. 24. *From 'Scribner's Magazine,' January, 1893. With illustrations.*

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Age of the Earth.

American Journ. Science 45 (1893): 1-20.

King.

The Age of the Earth. By Clarence King.

A re-discussion of the measurement of Earth-age by rate of cooling of diabase, which, combined with other considerations, gives 24 million years as the maximum.

Geodesy.

American Journ. Science 45 (1893): 33-53.

Woodward.

Preliminary Account of the Iced-Bar Base Apparatus of the United States Coast and Geodetic Survey. By R. S. Woodward.

A new method of measuring bases by means of bars kept by melting ice at the temperature of 32° when in use.

Geodesy.

Revue de Geog. 16 (1893): 43-55.

Lallemand.

Les Progrès réalisés en France dans la Mesure des Altitudes, et la détermination du niveau des mers. Par Ch. Lallemand.

A lecture given at the Sorbonne before the French Topographical Society on November 13th, 1892, by the chief of the French Survey.

Geysers.

American Journ. Science 45 (1893): 54-60.

Graham.

Some Experiments with an Artificial Geyser. By James C. Graham.

Lakes.

Natural Science 1 (1892): 117-123.

Reid.

Great Lakes. By Clement Reid, F.R.S.

A contribution to the theory of the origin of the great lakes of America and Africa.

- Lakes.** *Mitt. Geog. Ges. Wien* 35 (1892): 471-533. **Damian.**
 Seenstudien. Von Josef Damian, in Trient. I. Seen in der Umgebung
 von Trient, westlich der Etsch. *Maps and diagrams.*

A comprehensive study of the lakes near Trent, with references to earlier workers.

- Meteorology.** **Nursingrow**
 G. v. Juggarow Observatory, Duba Gardens, Vizagapatam. Results of
 Meteorological Observations, 1891. With an Introduction, by A. V.
 Nursingrow. Calcutta, 1892: 12mo, pp. 184, portraits, etc. *Presented by*
A. V. Nursingrow, Esq.

- Mountains.** *Bol. Soc. Geog. Italiana* 5 (1892): 931-946. **Marinelli.**
 Sul criterè da seguirsi per la ripartizione dei sistemi montuosi nella
 Geografia in generale e nella Geografia didattica in particolare. Relazione
 del Prof. G. Marinelli.

On the general principles to be followed in the sub-divisions of mountain systems, a
 paper read to the Genoa Geographical Congress.

- Ocean Basins.** *Natural Sciences* 1 (1892): 418-426. **Wallace.**
 The Permanence of the Great Oceanic Basins. By Dr. A. Russel Wallace.

- Ocean Basins.** *Natural Science* 1 (1892): 508-513. **Jukes-Browne.**
 The Evolution of Oceans and Continents. By A. J. Jukes-Browne, B.A.

- Submarine Cañons.** *Jahresbericht Geog. Ges. München* 14 (1890-91): 21-52. **Linhardt.**
 Ueber unterseeische Flussrinnen. Von Dr. Ernst Linhardt.

The observations on submarine hollows in continuation of the course of rivers made
 by Forel, Buchanan, the United States' Coast Survey Officers, and others, are here
 brought together, and the origin of the feature discussed.

- Winds.** **Duponchel.**
 La Circulation des Vents et de la Pluie dans l'Atmosphère. Par A. Du-
 ponchel. Paris, Canut, 1892: 8vo, pp. 111. *Presented by the Author.*

A new but unproved theory of atmospheric circulation.

GENERAL.

- Bibliography.** **Jordell.**
 Catalogue Général de la Librairie Française, continuation de l'ouvrage
 d'Otto Lorenz (Période de 1840 à 1885: 11 volumes). Tome Douzième
 (Période de 1886 à 1890). Rédigé par D. Jordell. Quatrième fasc.
 Meynard—zaine. Paris, Nilsson, 1892: large 8vo.

- Bibliography.** **Löwy.**
 Catalogue of Hebraica and Judaica in the Library of the Corporation of
 the City of London. With a Subject Index by the Rev. A. Löwy.
 London, 1891: large 8vo, pp. xi. and 231. *Presented by the Library*
Committee of the Corporation of the City of London.

- Bibliography.**
 Quatrième Centenaire de la Découverte de l'Amérique. Catalogue des
 Documents Géographiques exposés à la Section des Cartes et Plans de la
 Bibliothèque Nationale. Paris, J. Maisonneuve, 1892: large 8vo, pp. vii.
 and 77. *Price* 3s. 6d.

- Biographical Dictionary.**
 Dictionary of National Biography. Edited by Sidney Lee. Vol. XXXII.
 Lamb—Leigh; Vol. XXXIII. Leighton—Lluellyn. London, Smith,
 Elder, & Co., 1892, 1893: large 8vo, pp. (vol. XXXII.) vi. and 445;
 (Vol. XXXIII.) vi. and 447. *Price, each vol., 15s.*

The following names, more or less connected with discovery and travel, appear
 among the notices in these volumes:—John Lambert, by T. Seecombe; William
 Lambton, by H. M. Chichester; Sir James Lancaster, by Prof. J. K. Laughton; John

Lander, and Richard Lemon Lander, by H. M. Chichester; William Landsborough, by G. C. Boase; Edward William Lane, by S. Lane-Poole; Sir Ralph Lane, by Prof. J. K. Laughton; John Dunmore Lang, by G. C. Boase; R. G. Latham, M.D., by the late G. T. Bettany; C. J. Latrobe; P. E. Laurent, by W. Wroth; John Lawson, by T. Seecombe; W. M. Leake, by W. Wroth; Arthur Leared, M.D., by G. Goodwin; John Ledyard, by Prof. J. K. Laughton; Mrs. Sarah Lee, by the Rev. M. G. Watkins; Sir J. H. Lefroy, by Colonel R. H. Vetch, R.E.; François Lequat, by Capt. S. P. Oliver; F. W. L. Leichhardt, by G. C. Boase; Charles Leigh, by Prof. J. K. Laughton; William Light, by H. M. Chichester; William Lithgow, by F. H. Groome; Charles Livingstone, and David Livingstone, by Colonel R. H. Vetch, R.E.; and J. A. Lloyd, by H. M. Chichester.

Biography. *Deutsche Rundschau* 15 (1892): 183-185. **W. W.**
Dr. Theodor Menke. *With portrait.*

Columbus. **Adams and Wood.**
Columbus and His Discovery of America. By Herbert B. Adams Ph.D., and Henry Wood, Ph.D., Baltimore. The Johns Hopkins Press, 1892: 8vo, pp. 88.

One of the Johns Hopkins University Studies of Historical and Political Science.

Columbus. **Rein.**
Columbus und seine vier Reisen nach dem Westen. Natur und hervorragende Erzeugnisse Spaniens. Von Dr. Johannes Rein, Professor der Geographie, Bonn. Leipzig, Engelmann, 1892: 8vo, pp. 244. *Illustrations and maps. Presented by the Author.*

The account of Columbus' voyages is interspersed with chapters on the province of Huelva, and on the physical and industrial geography of modern Spain.

Columbus. **Winsor.**
America Prefigured. An Address at Harvard University, October 21st, 1892. By Justin Winsor. Cambridge (Mass.). *Privately printed*, 1893: small 4to, pp. 11. *Presented by the Author.*

Educational. *Bol. Soc. Geog. Italiana* 5 (1892): 965-974. **Porena.**
Della vicende e degli ordinamenti dell' insegnamento geografico nelle scuole primarie dalla costituzione del Regno, e proposte dei mezzi per migliorarlo. Relazione del Professor F. Porena.

On elementary geographical teaching in Italy.

General Geography. **Reclus.**
Nouvelle Géographie Universelle. La Terre et les Hommes, par Elisée Reclus XVIII., Amérique du Sud. Les régions Andines, Trinidad, Vénézuëla, Colombie, Ecuador, Pérou, Bolivie et Chili. Paris, Hachette et Cie, 1893: 4to, pp. 848.

In this volume the greater part of South America is described with the usual lucidity of style, and illustrated by the usual profusion of maps and pictures characteristic of the whole work.

Historical. **Berger.**
Geschichte der Wissenschaftlichen Erdkunde der Griechen. Von Dr. Hugo Berger. Vierte Abtheilung. Die Geographie der Griechen unter dem Einflusse der Römer. Leipzig, Von Veit & Co., 1893: 8vo, pp. xii. and 170.

The previous parts of this work were noticed in the *Proceedings* for 1892 at p. 505. The present part treats of the geography of the Greeks at the time of the Roman sway.

Historical. **Wagner.**
Die dritte Weltkarte Peter Apians v. J. 1530 und die Pseudo-Apianische Weltkarte von 1551. Vorläufige Mitteilung von Hermann Wagner. Small 4to pp. [32.] *From the Göttingen Nachrichten for December 28, 1892. Presented by the Author*

- Historical Geography.** *Bol. Soc. Geog. Italiana* 5 (1892): 553-865. **Levasseur.**
 Sur l'expansion de la race européenne hors d'Europe depuis la découverte de l'Amérique. Communication de M. E. Levasseur.

A paper read to the Geographical Congress at Genoa.

- Historical Geography.** **Levisux.**
 Considérations géographiques sur les centres de Civilisation. Par Fernand Levisux. Bruxelles: Vanderauwera, 1892: 8vo, pp. 16. *With map. Presented by the Author.*

- Historical Geography.** **Noël.**
 Histoire du Commerce du Monde depuis les temps les plus reculés. Par Octave Noël, Professeur à l'École des hautes études commerciales. Paris, Plon, Nourrit et Cie., 1891: small 4to, pp. xxvii. and 332.

Treats of ancient times and the Middle Ages, with numerous illustrative maps.

- Navigation.** *Ausland* 65 (1892): 769-74, 791-96, 809-13, 824-30, 835-43. **Gelcich.**
 Beiträge zur Geschichte der oceanischen Schifffahrtregeln und Segelhandbücher. Ein Beitrag zur Geschichte der maritimen Geographie. Von Eugen Gelcich.

A sketch of the history of maritime enterprise down to Maury's time.

- Norddeutscher Lloyd.** **Lindeman.**
 Der Norddeutscher Lloyd. Geschichte und Handbuch. Bearbeitet von Dr. Phil Moritz Lindeman Bremen: Schönmann. 1892: 8vo, pp. xxi. and 487. *Tables, maps, and illustrations. Presented by the Author.*

A handsome volume, with maps of the routes followed by the company's steamers, and pictures and plans of the principal harbours of the world.

- Oriental Literature.** **Max Müller.**
 The Sacred Books of the East. . . Edited by F. Max Müller. Vols. XXX, XXXII, and XXXVII. Oxford, the Clarendon Press, 1891-1892: 8vo, pp. (Vol. XXX.) xxxix. and 376; (Vol. XXXII.) cxxv. and 556; (Vol. XXXVII.) i. and 506. *Presented by the Secretary of State for India.*

NEW MAPS.

By J. COLES, *Map Curator, R.G.S.*

EUROPE.

- Austria-Hungary.** **Military Geographical Institute, Wien.**
 Hypsometrische Karte von Oesterreich-Ungarn. K. u. k. militärgeographisches Institut. Wien. Sheets:—B. 2, Prag, Eger, Budweis, Linz, München, Regensburg; B. 3, Laibach Villach, Kufstein, Belluno; B. 4, Pola, Zara, Comacchio; C. 2, Brünn, Troppau, Neutra; C. 3, Wien, Graz, Budapest; C. 4, Agram, Brod, Esseg, Glina, Knin, Sarajevo; C. 5, Ragusa, Mostar; D. 2, Krakau, Przemyśl, Jaroslaw, Kaschau, Leutschau; D. 3, Szegedin, Grosswardein Orad, Erlau, Szolnok; E. 2, Tarnopol, Brody, Strij, Czernowitz; E. 3, Klausenburg, Máramaros-Sziget, Tölgyes. Scale 1: 750,000 or 10·3 geographical miles to an inch. *Price 2s. each sheet.*

This map is in course of publication, and is based on the Map of Central Europe, recently completed by the same department. In the present instance the sheets are orographically coloured in different shades, indicating elevations varying from 150 metres to 300 metres. Altitudes are also shown by contour lines, and wherever these touch the margin of the map, their values are given in figures. All roads are shown by red lines, railways black, and rivers blue. The colours used are remarkably well chosen, and the map as a whole reflects credit on all concerned in its production.

Austria-Hungary.**Tipser.**

Artaria's Universal-Administrativ-Karte der Oesterreich-ungarischen Armee mit der Eintheilung des Reiches in die Territorial- und Ergänzungsbezirke des k. u. k. Heeres und der Kriegsmarine, der k. k. und k. ungarischen Landwehren und des Landsturmes. Bearbeitet von Oberst Tipser. Scale 1 : 1,500,000, or 20·4 geographical miles to an inch. Mit Beilage: Uebersicht der regelmässigen Ergänzungen an Truppen, welche die bestehende Stellungsbezirke Oesterreich-Ungarns für das stehende Heer, für die Kriegsmarine, für die Landwehr und für den Landsturm zu leisten haben. Zweite Auflage. Wien, Verlag und eigenthum von Artaria & Co., 1893. *Presented by the Publishers.*

Austria-Hungary.**Artaria.**

Artaria's Eisenbahn- u. Post-Communications-Karte v. Oesterreich-Ungarn 1893. Scale 1 : 700,000, or 23·3 geographical miles to an inch. Artaria & Co., Wien. *Price 2s. Presented by the Publishers.*

England and Wales.**Ordnance Survey.**

Publications issued since December 15th, 1892.

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(E. Stanford, Agent.)

AFRICA.**Equatorial Africa.****Philip.**

A Mission Map of Equatorial Africa, showing more especially the Stations of the Baptist Missionary Society. Scale 1 : 1,650,000, or 23 geographical miles to an inch. G. Philip & Son, London, 1892. On roller, varnished. *Presented by the Baptist Missionary Society.*

This is 'Philip's Map of Equatorial Africa, showing Stations of the Missionary Societies,' with the stations of the Baptist Missionary Society underlined in red, and a change in the title.

South African Republic.**Troye.**

Troye's Map of the Transvaal or South African Republic. Scale 1 : 500,000, or 6·8 geographical miles to an inch. Published for Fehr & Dubois. Pretoria, 1892.

This is a six-sheet map of the Transvaal or South African Republic. The districts Heidelberg, Pretoria, Middleburg, Ermelo, Wakkerstroom, Utrecht, Pietretief, southern portion of Lydenburgh, portion of Potchefstroom, and Marico, have been

compiled from actual surveys placed at the disposal of the author by the Surveyor-General of the South African Republic. The districts of Waterberg, a portion of Rustenburg and Zoutpansberg, have been compiled in the Surveyor-General's Department from Plans of Inspection under the superintendence of Government Surveyors. Much information has also been obtained from the maps and plans of Jeppe, Loveday, and others. So far as possible the boundaries of landed property have been laid down, with their names; but owing to want of reliable information the map is in this respect somewhat incomplete. The material differences between this map and those previously published will be found in the north and north-east of the Republic. The map is printed in colours, on linen; all means of communication are laid down, and the gold-fields are clearly shown. In the north-west corner of the map there is an inset of South Africa, drawn on one-tenth of the scale of the principal map. This will serve a useful purpose as showing the connection by rail between the different parts of South Africa.

Brazil.**AMERICA.****Lange.**

Kartenskizze des Rio Paranapanema-Thales. Von Henry Lange. Scale 1 : 4,000,000, or 55.5 geographical miles to an inch. Meteorologische Stationen im Staate São Paulo. Scale 1 : 6,000,000, or 82.2 geographical miles to an inch. *Petermann's Geographische Mittheilungen*. Jahrgang, 1882. Taf. 21. Gotha, Justus Perthes. *Presented by the Publisher.*

Guiana.**Raleigh.**

Sir Walter Raleigh's Karte von Guayana um 1595, von L. Friederichsen. Separatabdruck aus Festschrift der Hamburgischen Amerika-Feier, 1892. *Presented by Herr L. Friederichsen.*

AUSTRALASIA.**British New Guinea.****Surveyor-General of Queensland.**

Map of British New Guinea. Compiled from the latest Official Maps and Charts and embracing the recent inspections of districts, 1892. Scale 1 : 2,000,000, or 27.7 geographical miles to an inch. Printed and published at the Surveyor-General's Office, Brisbane, Queensland. *Presented by J. P. Thomson.*

CHARTS.**Admiralty Charts.****Hydrographic Department**

Charts and Plans published by the Hydrographic Department, Admiralty. November and December, 1892. *Presented by the Hydrographic Department, Admiralty.*

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CHARTS CANCELLED.

1332 Staten Island	..	{ New chart. Strait of Le Maire with Staten Island 1332
1927 Corinto Harbour	..	{ New plan. Corinto Harbour. Acajutla anchorage 1927
2052 Plan of Woodbridge Haven on this sheet	..	.. .. .
2789 Entrance of the river Han.		

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS.

No. 2052, England, east coast :—Harwich Approaches. 125, North Sea :—Ostende Roads. 2305, Norway, west coast :—Stav Fiord to Romdals Islands. 2310, Norway, west coast :—Dønnas to Fleina. 2252, Baltic Sea :—Gulf of Bothnia. 2301, Gulf of Bothnia :—Friderag to Tome Point, and Gamla Karleby to Taavö. 2694, France, north-west coast :—Channels between Ile D'Ouessant and the Mainland. 562, Spain, east coast :—Port of Valencia. 2778, River St. Lawrence :—Long Point to Lachine Rapids. 2457, North America, east coast :—Oyster and Huntington Bays. 848, Africa, east coast :—Mallindi to Juba. 669, Africa, east coast :—Lamu, Manda, Patta, and Kwihu Bays. 668, Africa, east coast :—Lamu, Manda, and Patta Bays. 721, Indian Ocean :—Seychelles Group. 40, India, west coast :—Karachi Harbour. 50, India, west coast :—Diu Head to Gopinath Point. 1746, Borneo, north-west coast :—Api Point to Sarawak. 287, Borneo, north coast :—Gaya Bay on the west to Sandakan Harbour on the east. 1649, Borneo, east coast :—Lankayan to Sandakan Harbour. 1650, Borneo, east coast :—Mallawalli Island to Lankayan. 2576, Sulu Sea :—Sulu Archipelago. 930, Eastern Archipelago :—Anchorages between Borneo and New Guinea. 1466, China, south coast :—Hongkong. Fotaunum Pass. 1199, China, east coast :—Kweshan Islands to the Yang-tse-kiang. 1602, China, east coast :—Approaches to the Yang-tse-kiang. 208, Japan :—Harbours and Anchorages on the east coast of Nippon. 1670a, Australia, east coast :—Moreton Bay, northern portion. 2354, Australia, east coast :—Cape Grenville to Booby Island.

(J. D. Potter, Agent.)

North Atlantic Ocean.

United States Hydrographic Office.

Pilot Chart of the North Atlantic Ocean, January, 1893. With Supplement containing chart and text descriptive of the Transatlantic Steamship Routes, including the proposed routes between New York and Gibraltar. Published at the Hydrographic Office, Bureau of Navigation, Navy Department, Washington, D.C. Richardson, Clover, Lieutenant-Commander, United States Navy, Hydrographer. *Presented by the United States Hydrographic Office.*

GENERAL.

The World.

Cassell.

The Universal Atlas. Complete in 28 parts, including Index. Published by Cassell & Co., Limited, London, for the Atlas Publishing Company, Limited. Part 22. *Price 1s. Presented by the Publishers.*

The present issue of this atlas contains a map of Rhenish Prussia, Westphalia, Hesse Nassau, Waldeck, Lippe, and Grand Duchy of Hesse; and maps of the Polynesian Groups, South Polar Regions, New Guinea, and the Papuan Archipelago. It also includes a part of the index.

The World.

Johnston.

W. & A. K. Johnston's Royal Atlas of Modern Geography. Edition in monthly parts. Part 15. W. & A. K. Johnston, Edinburgh and London, 1892. *Price 4s. 6d. each part. Presented by the Publishers.*

This part contains maps of Australia (with inset plans), and Canada West. Each map is accompanied by an index.

The World.**Smith.**

Free Church of Scotland Mission Map. Designed by Dr. George Smith, F.R.G.S. Mercator's projection. Equatorial scale, 4° to an inch. Ruddiman Johnston & Co., Limited, London. *Presented by the Foreign Missions Committee of the Free Church of Scotland.*

This map is coloured to show the religions of the world, and the positions of the mission stations of the Free Church of Scotland. At the bottom of the map there is a table in which the names of foreign missionaries from Scotland, and their present stations are given.

The World.**Bacon.**

Commercial and Library Atlas of the World, containing one hundred double-page maps, and one hundred inset maps, including all the latest discoveries, extensive letterpress description, alphabetical index, populations from the latest censuses, gazetteer of two thousand principal towns, statistical diagrams and tables, etc., etc. Edited by G. W. Bacon, F.R.G.S. London, G. W. Bacon & Co., Limited, 1893. *Price £2 2s.*

This atlas contains one hundred principal maps, and numerous supplementary plans. Some of these are new, but the manner in which some of the maps are produced leaves much to be desired. This is especially so with regard to the hill shading. In other cases the impressions are faint and obscure.

The World.**Kiepert.**

Kiepert's Grosser Hand-Atlas. Neue Lieferungs-Ausgabe in 45 Karten. Ausgabe in 9 Lieferungen à 5 Karten mit statistischem Material und Namen-Verzeichnis mit Bevölkerungsziffern zu jeder Karte. Dritte, im Zeichen-Institut der Verlagshandlung unter Leitung von Dr. R. Kiepert teils vollständig neu bearbeitete, teils gründlich berichtigte Auflage. Berlin 1893, Geographische Verlagshandlung Dietrich Reimer, Inhaber: Hofer & Vohsen. *Price 4s. each part.*

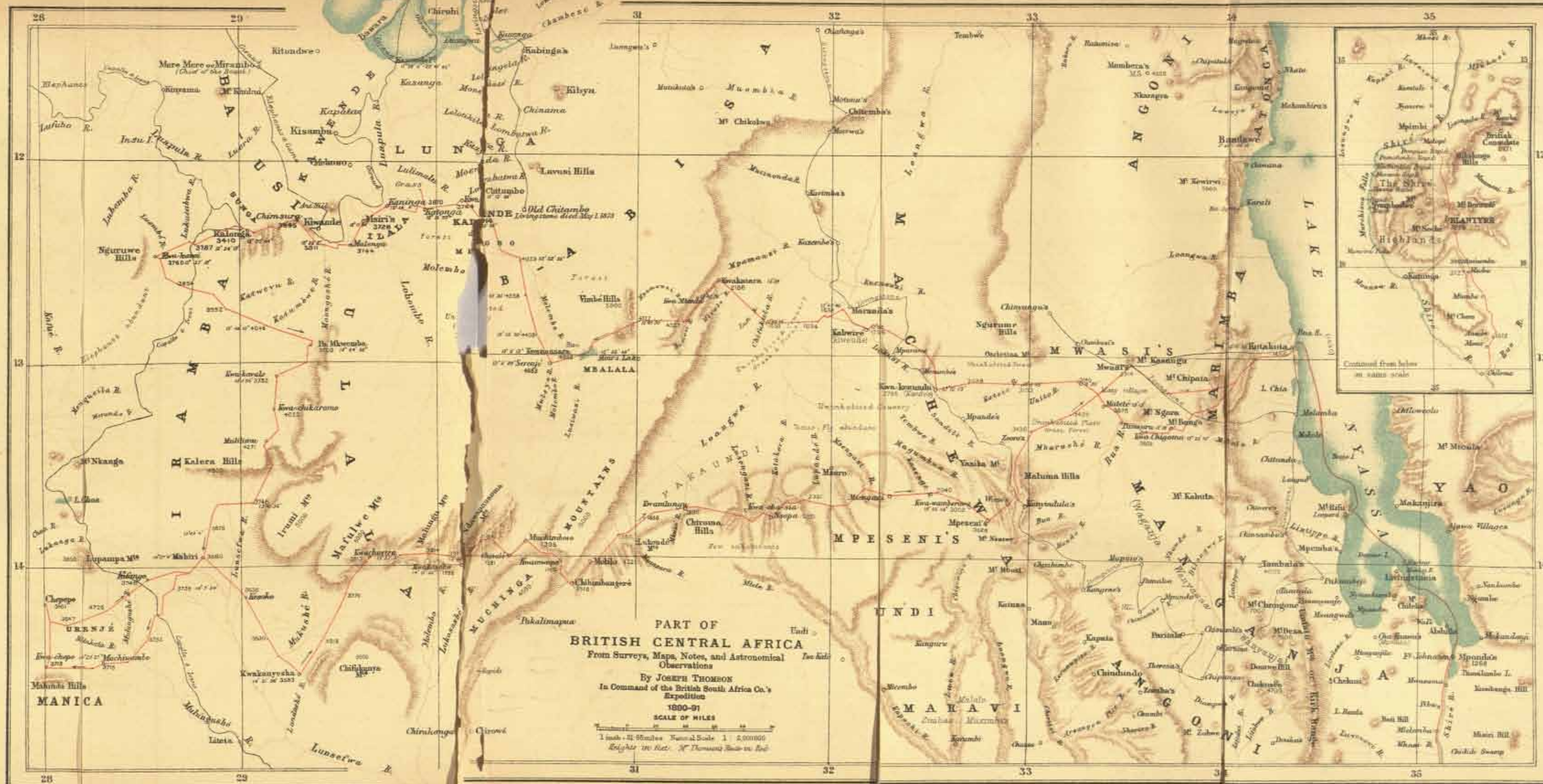
This is the first issue of the third edition of Kiepert's well known 'Grosser Hand-Atlas.' It will be completed in nine parts, each of which will contain five maps. The present issue includes:—Maps, No. 8, Hannover und Schleswig-Holstein; No. 25, Dänemark und Süd-Schweden; No. 39, Nordwestliches Africa; No. 40, Nord-America; No. 42, Mittel-America und West-Indien. It is announced by the publishers that the present edition, including statistical information by Dr. Paul Lippert, will be completed by the end of the present year; each map being accompanied by letterpress and an index. The maps contained in the present issue are nicely drawn, the colouring is well chosen, and the lettering is remarkably clear.

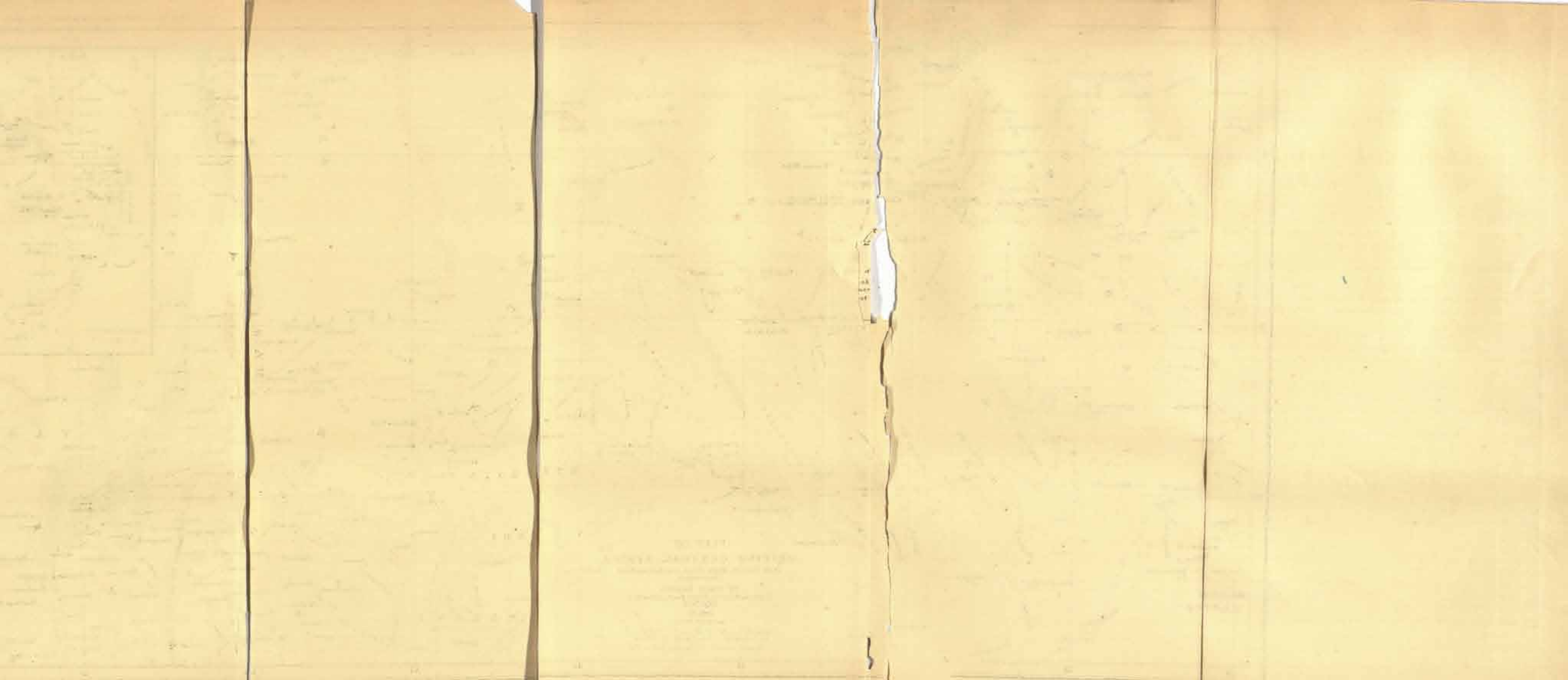
PHOTOGRAPHS.**Zanzibar.****Kirk.**

Views taken in Zanzibar Island, and on the African Coast, in 1884-85. By Sir John Kirk, M.D., K.C.B., &c. *Presented by Sir John Kirk.*

This is a very interesting series of photographs. They are excellent specimens of photography, and well chosen to illustrate the natural features, and antiquities of the country.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





The Geographical Journal.

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VOL. I.

A JOURNEY UP THE BARAM RIVER TO MOUNT DULIT AND THE HIGHLANDS OF BORNEO.

By CHARLES HOSE, Resident of the Baram District, Saráwak, Borneo.*

His Highness the Rajah of Saráwak having communicated to me the wish of the Royal Geographical Society for some account of my journey to the head-waters of the Baram and Tinjar Rivers, I have pleasure in complying with the request.

It may not be amiss to remind even a geographical audience that Saráwak is a State situated on the north-west of Borneo, ruled over by an English Rajah, Sir Charles Johnson Brooke, G.C.M.G., nephew of the original Rajah Brooke, whose career must be known to most of you. The country has been quite recently placed under British protection. The boundary of the State is Tanjong Datu, on the extreme west, long. $109^{\circ} 40'$ E., and the mouth of the Trusan river the most easterly point, long. $115^{\circ} 13'$ E., with a width of about 250 miles inland from the coast. The coast-line is 460 statute miles in length.

I may also recall the fact that in 1881 Mr. W. M. Crocker, who had been Resident of Saráwak, and whose name is intimately associated with North Borneo, read at one of the Society's meetings some interesting notes on Saráwak and Northern Borneo, which will be found in the *Proceedings* for 1881, p. 193. It will be seen from his map that Baram at that date belonged to Brunei and not to Saráwak, and that its geography was almost a blank. It is true that the Rajah did ascend the river for some distance before the province was ceded, but that was merely a running visit.

The Baram River discharges itself into the China Sea at lat. $4^{\circ} 37' 15''$ N., long. $115^{\circ} 59' 30''$ E. Its width at the mouth is about three-quarters of a mile, with sandspits running out on either side to the distance of 2 miles. These sandspits are washed away during the

* Read at the Evening Meeting of the Royal Geographical Society, January 16th, 1893. Map, p. 288.

north-east monsoon, but appear again in the south-west monsoon. About 2 miles out there is, unfortunately, a bar, which prevents vessels drawing more than 7 feet of water from entering the river. There is, however, fairly good anchorage for ships in the bays on each side of the Baram point, so long as the wind is north-east or south-west; but when due west there is no shelter whatever. To give an idea of the volume of water running down, I may state that it is constantly found to be fresh at the distance of 2 miles outside; and very rarely in the driest weather the tide reaches Claudetown, a distance of 60 miles. The land on each side of the mouth consists of alluvial deposits, marshy, and covered with casuarina trees and coarse grass, the latter affording pasturage for deer and wild buffaloes. For the first 15 miles up the river the reaches are long and devoid of interest, excepting for the wonderful growth of the Nipa palms, which line the banks, growing to a height of 30 feet, and from which the natives procure both salt and sugar. The ground is covered with a network of roots, and constantly flooded, the whole country for miles being quite flat. At Pagalayan the land is a little higher, the trees being larger and presenting a more healthy appearance. At this point the depth of the river is in some places as much as 20 fathoms. For the next 15 miles the country consists mainly of grassy plains, which have been formed by the river altering its course, washing away from one side and silting up on the other. The jungle here is dense, thorny, and low, and few inhabitants are found in this locality. At the mouth of the Bakong River—a tributary—small farms have been established, and plantations of fruit-trees and cocoanut palms are dotted about wherever an acre of high land appears. A few miles farther on are lakes of no great depth or size, which have apparently been made by the overflow of the river at various times; and at one very peculiar bend of the river a canal has been cut, thereby saving about 4 miles. The first appearance of really high ground is at Claudetown, the Government station and principal town of the district, situated about 60 miles from the mouth. Here the Chinese merchants have erected magnificent shops and warehouses, and the whole trade of the river is centred at this spot—lat. $4^{\circ} 3' 15''$ N., long. $114^{\circ} 32' 30''$ E.

The fort, standing immediately above the river at the height of about 50 feet, commands a view of the whole township. From this spot Mount Mulu, and, indeed, the whole of the Mulu range is distinctly seen. The Government steam-launch, *Coconut*, is stationed here for up-river use; and the mail-steamer, *Adeh*, calls about once a month, bringing up supplies for the district, such as ironware, crockery, salt-fish, cotton-goods, tobacco, cloth, etc., and taking back cargoes of rattans, gutta-percha, india-rubber, beeswax, edible birds' nests, and camphor. Other steamers that occasionally call at this port are the *Sri Putri*, and the *Bujang Baram*. The *Lorna Doone* leaves mails at the lighthouse on her

journey northward. The jungle in the immediate vicinity of Claudetown is composed of hard and valuable timber, some fine specimens of which are the Meribo trees (*Afzelia palembanica*) measuring 5 feet in diameter, and sound all through. Acres of forest might be felled and conveyed to the river at very little expense. Twenty-five miles above Claudetown is the junction of the Tinjar River, the principal tributary of the Baram; the country around is flat, with dense jungle, abounding with rattans. Here the Chinese have commenced working "shingles" of ironwood, which is very plentiful.

The next place of note is the town of Long Tutau, situated at the mouth of the Tutau River. The races of people living here are the Long Kiputs and Batu Blas; and it is in this locality that the agents



SEA DYAK LONG-HOUSES.

of the various traders in Claudetown, both Chinese and Malay, congregate to barter with the tribes from the interior. Many of these traders build houses upon rafts, which are moored along the banks of the river at every landing stage. In these floating houses they live for months, and even years, until the raft is stocked with produce. They then float down river to Claudetown, sometimes bringing as many as 250,000 canes on one raft. At Long Ikang the high land appears again, mountains sloping down to the river's bank. At Batu Gading the course of the river is through a limestone district, and the scenery is very beautiful. At Long Salai the rapids commence. Here the Baram is about 100 yards across.

Passing on to Long Mari, there are numerous islands formed of pebbles, which are covered when the river is swollen, but at other times

are dry, and form a pleasing feature in the landscape. From here to the mouth of the Akar River the stream flows through a somewhat striking district. On either side are vast sandstone and shale cliffs, rising sheer from the water's edge to a considerable height, narrowing the river in places to about 50 yards. The stream rushes over huge boulders at a terrific rate, causing dangerous backwaters, and sucking down immense logs, which come to the surface at about 100 yards from where they disappear. Giham Tipang is a particularly dangerous rapid, the passing of which is accomplished at very considerable risk; the volume of water dashing over the rocks, and rising in waves 5 or 6 feet high, makes it appear impossible for a boat to pass. The "dugout," however, is tied fore and aft with rattans, and dragged through the middle of the rapids by one half of the men, the others remaining in the boat to work with poles. The noise is deafening, each man shouting at the top of his voice; and after pulling the boat for about an hour, the head of the rapid is reached, and immediately those on the rocks jump into the boat and begin paddling with all their might into some backwater for fear of being carried back over the rapid. For a moment the "dugout" scarcely moves, but at last their united efforts tell, and the boat begins slowly to make way to the nearest bank. Occasionally the current is too strong for them, and feeling themselves carried back, they jump overboard, holding on to the boat with one hand, while with the other they grasp any rock or bush that they can clutch, thus arresting the boat. One of the party then takes a turn with the rattan round the rock, and so makes it fast until they can start again. Sometimes there is nothing to catch hold of, and then, seeing it hopeless to fight against the stream, everyone turns round in the boat, and seizing their paddles and poles, they allow the vessel to shoot over the fall into the seething waters below. The sensation is undoubtedly singular, but it does not last long. The boat is bumped about in all directions, and carried on at a tremendous rate for a few seconds, the water leaping in on either side and the men *kicking* it out continually with one foot. The moment they are over, the vessel quietly glides round to the nearest back-water, and once more you draw your breath freely. Having thus escaped, they smoke a cigarette before making another attempt to drag up the boat.

The soil at the mouth of the Akar River is very fertile, and the mountain scenery is lovely. From here to the mouth of the Salaan River the banks are covered with extensive groves of fruit-trees, many of them unknown to European taste, but including also such as Durian, Mangosteen, and thick-skinned oranges. A beautiful palm-tree, called by the natives "Ijook" (*Arenga saccharifera*), is very abundant in this locality. Passing the mouth of the Salaan, the rapids become less frequent, and the country being more open, one appears to have passed through the mountain-chain. The river is clear and perfectly smooth. At the mouth of the Libbun, however, one meets again with waterfalls

which make the entrance of this river almost impracticable. Looking at the country round, the district known as the head of the Kayan River comprises one vast chain of mountains, mostly having table-land at their summits; and roughly judging, I should say from 5000 to 8000 feet high. On the other side, known as the Kalabit district, grassy plains extend for miles, which are very unusual in Borneo.

The Baram, Rejang, and Batang Kayan Rivers have their sources within a comparatively short distance of each other, as will be seen on the map which I have prepared.

I may here mention that the total revenue of the State of Sarawak in 1891 was \$417,123.96, and the expenditure \$417,487.46; the trade returns for the same year were as follows:

Imports.			Exports.		
	Tons.	Value in Dollars.		Tons.	Value in Dollars.
Foreign . . .	35,794	1,602,075	Foreign . . .	36,674	1,939,884
Coasting . . .	26,792	784,735	Coasting . . .	38,471	709,996
Total . . .	62,586	2,350,810	Total . . .	75,145	2,649,880

I will now give a short account of the journey which I made to Mount Dulit.

On September 14th, 1891, in company with Mr. A. H. Everett, I chartered the steam-launch *Coconut* to convey us and our men as far as it was possible for a small steamer to proceed up river. The nearest route to Mount Dulit is up the Tinjar. This river we entered after about four hours' steaming from Claudetown, and it was not until the following day that it was necessary to take to our "dugouts" (boats most suited to the rapids we should pass), having covered a distance of 90 miles. The following day we paddled as far as the Barawan village of Long Pruan, where we rested for the night, in the house of a man named Taman Liri, who is chief of the Barawans and the Government tax-collector.

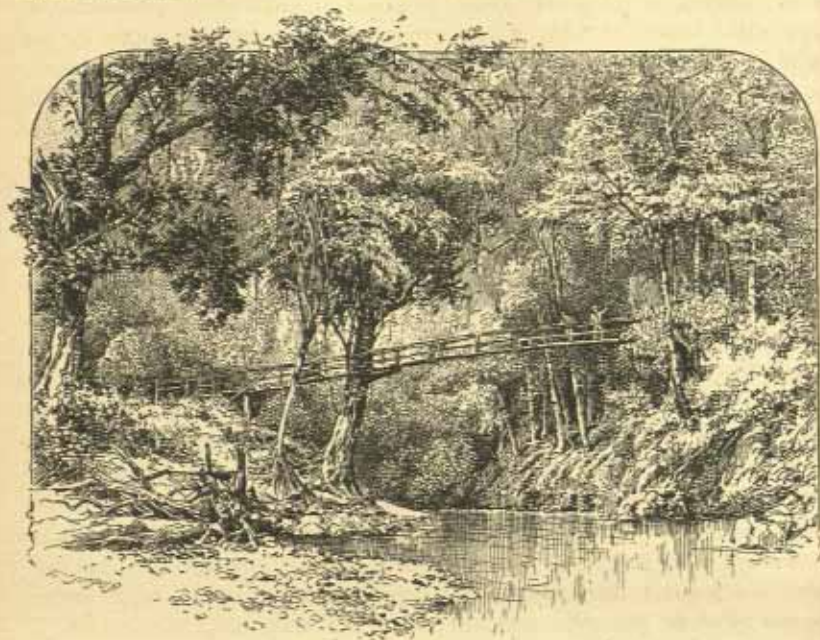
On September 16th towards nightfall we reached Long Tisam. Within an easy walk from this village, the Central Borneo Company have commenced working a deposit of sulphide of antimony, which, so far, has been spoken of favourably. We spent the night in the house of one Avan Avit, also a Barawan. Being somewhat fatigued we retired early; and it was not until the next morning that I discovered, at the head of my bed, a large box which I had not noticed the night before, and which proved to be a coffin; and on inquiry I was informed that it contained the mortal remains of the chief's wife! As this may appear strange, I may as well explain that it was the custom of these people to keep a corpse in the house for three months before burying it. They make a large coffin of soft wood, and decorate it with various colours,

obtained from the juice of roots, the whole being elaborately carved. The lid of this coffin is rendered air-tight with a resinous substance procured from many of the Borneo forest trees, and generally known as "dammar." A bamboo about 20 feet long and 3 inches in diameter is then prepared by boring through the joints, so as to form it into what it is really intended for, a sort of drainpipe. One end of this pipe is driven into the ground, the other end is brought through the floor of the house, and inserted in the bottom of the coffin. During the first week after the body has been placed in the coffin, a large torch is kept burning day and night at the head and foot. After about three months a mausoleum is prepared, which is made of hard wood called billian, and raised about 12 feet off the ground on two massive pillars carved with various artistic designs, and figures of men and women. The body is then removed from the house and conveyed with much ceremony to this tomb. Everyone present sends one or more cigarettes made of native tobacco, wrapped in the dried leaves of the wild banana (*Pisang Utan*) to their dead relatives in "Apo Leggan" (Hades). These cigarettes are placed on the top and around the coffin; and, should the body be that of a man, his weapons, tools, and a small quantity of rice, with his "priok" (cooking-pot), are deposited in the tomb with him that he may be able to continue his daily pursuits in the other world. But if of a woman, her large sun-hat, her little hoe—used for weeding in the paddy fields—her beads, earrings, and other finery are placed with her body, that she may not be found wanting on her arrival the other side of the grave. The earrings are especially important, and are usually made of brass or copper, weighing sometimes as much as two pounds each. The lobe of the ear is pierced when the child is about eight months old, and earrings weighing about two or three ounces apiece are hung in the ear. This weight gradually drags down the ear-lobe to a great length, and adding weights yearly as the child grows, by the time she has come to maturity the ears will reach her breasts. I have seen a girl put her head through one of these elongated ear-lobes.

I was once present when the corpse of a boy was being placed in the coffin, and I watched the proceedings from a short distance. As the lid of the coffin was being closed an old man came out on the verandah of the house with a large gong (*Tetawak*) and solemnly beat it for several seconds. The chief, who was sitting near, informed me that this was always done before closing the lid, that the relations of the deceased who had already passed out of this world might know that the spirit was coming to join them; and upon his arrival in "Apo Leggan" they would probably greet him in such terms as these: "O grandchild, it was for you the gong was beating which we heard just now; what have you brought? How are they all up above? Have they sent any messages?" The new arrival then delivers the messages intrusted to him, and gives the cigarettes as proofs of the truth of what he says. These cigarettes

retain the smell of the hands which made them, which the dead relations are able to recognise.

There is another strange ceremony at which I was once present, called "Dayong Janoi," in which the dead are supposed to send messages to the living, but to describe it would take up too much of this paper. It proves, however, that "spiritualism" is of very ancient practice among the Kayans, but it would perhaps be interesting to mention the various abodes of departed spirits, according to Kayan mythology. "Laki Tengangang" is the supreme being who has the care of all souls. Those who die a natural death, of old age or sickness,



NATIVE BRIDGE, BORNEO.

are conveyed to "Apo Leggan," and have much the same lot as they had in this world.

"Long Julian" is the place assigned to those who die a violent death, *e.g.*, those killed in battle or by accident, such as the falling of a tree, etc. Women who die in child-bed also go to "Long Julian," and become the wives of those who are killed in battle. These people are well-off, have all their wants supplied; they do no work and all become rich. "Tan Tekkan" is the place to which suicides are sent. They are very poor and wretched; their food consists of leaves, roots, or anything they can pick up in the forests. They are easily distinguished by their miserable appearance. "Tenyu Lallu" is the place assigned to still-born infants. The spirits of these children are believed to be very

brave, and to require no weapon other than a stick to defend them against their enemies. The reason given for this idea is, that the child has never felt pain in this world, and is therefore very daring in the other. "Ling Yang" is the place where people go who are drowned. It is a land of plenty below the bed of the rivers, and these are the spirits upon whom riches are heaped in abundance, as all property lost in the waters is supposed to be appropriated by them.

But to return to my journey. On the 17th I reached Long Sukong, at which place the rapids commence; and having procured some fresh boatmen we poled as far as Long Masso, where we arrived next day, and spent the night at the head of a rapid. The following day brought us to Long Kapa, which was as far as we could proceed by boat. From this point Mount Dulit stood out very clearly, and having taken my bearings before nightfall, in case the mountain should be enveloped in mist the next morning, we passed the night in the house of one Aban Lia, a chief of the Sibops. These people are skilful in the use of the blow-pipe (sumpitan), and by use of this weapon numbers of monkeys are killed, from which the Bezoar stones are obtained. These stones are held in great estimation by the Chinese, who purchase them readily at a high price, for using as medicine for all kinds of ailments. They are reported to be found both in the intestines and in the gall bladder of the monkey. They are of various dimensions, usually flattened in shape, somewhat oval, from the size of a pea to that of a hen's egg—the largest realising from \$20 to \$25. The monkeys in which these stones are most commonly found are the "*Semnopithecus rubicundus*," and "*Semnopithecus hosei*." A softer form of this stone is also found in the porcupine (*Hystrix crassispinis*). These animals are shot with poisoned arrows, blown from the sumpitan by Sibops and Punans. Sometimes the poison loses its virulence when not quite fresh, and an animal will then carry away the arrow, although it may have pierced its body to the depth of 2 or 3 inches, and it is easily broken off in the animal's movement through the jungle, leaving the poisoned end in the body. Monkeys have been shot, in whose bodies a broken piece of an arrow has been found, covered with a coating of the substance called "Bezoar" stone. The localities mostly frequented by these monkeys are the spurs of large mountains and salt springs, which are common in the interior.

At daybreak we commenced our overland journey, and I was agreeably surprised at the favourable nature of the country, as we met with no swamps, and not very thorny jungles. Having crossed the heads of many small streams, which doubtless have their sources on Mount Dulit, we came to a small hill of about 500 feet, over which we crossed, and before night came on we arrived at a point which proved to be the foot of Mount Dulit.

Next morning, September 21st, we began the ascent of the mountain,

which for the first 1000 feet was very gradual, and at 2000 feet we agreed to make a hut, which would form a storehouse for our rice, etc. This we completed in daylight, and we passed the night there. The following day I sent back all the party except two to fetch the rice and other stores which we had been unable to bring, and they returned next day, each carrying a load of about 40 lbs. Two more journeys back had to be made before all our stores were brought up, during which time I, with the two who remained with me, cut a track to the height of about 4000 feet. Having cleared away the thorns, and constructed rattan ladders in the precipitous places, we returned to the hut, which I shall hereafter refer to as "the store."

I now divided up the party, and taking five men to the altitude of 3500 feet, directed them to make another hut, on a lovely spot just over a cascade, the fall of which was about 30 feet. This spot commands a magnificent view of both Mount Kalulong and Mount Tamuduk. I then returned to the store, leaving the men at the higher elevation to shoot what birds and other creatures they might find. The men at the store I found making preparations for the construction of various kinds of native traps called "jerat." The men visit these traps night and morning, and numbers of animals and ground birds are caught by them. Those most frequently trapped are the little moose deer, *Tragulus napu* and *Tragulus javanicus*, and of the carnivora, *Viverra tangalunga*, *Hemigale hardwicki*, *Felis bengalensis*, *Felis planiceps*, and my new species of "Hemigale," which has been lately described by Mr. Oldfield Thomas as *Hemigale hosei*, was also obtained by one of these traps.¹

During the next few days I was constantly between the two huts, working one party against the other with the reports of the success each had met with, and late at night I was employed in giving directions as to skinning and drying the specimens obtained. The humidity of the atmosphere made it difficult to keep the skins in good condition, and the want of sun made it impossible to dry them otherwise than by fire. The men showed in many ways that they were interested in the work almost as much as myself, and great was the excitement when the first Bulwer's pheasant (*Lophophanes bulweri*) was brought in, having been shot by a man at the lower range. This bird we had all seen on several occasions, and heard its curious harsh note constantly around us.

The next morning the men at the higher ground shot a black kijang (*Cervulus muntjac*). The colour of this animal was much like that of a common deer (*Cervus equinus*), and not the least like the common muntjac. It had two tufts of black hair above the eyes. Considerable discussion ensued as to the probability of its being a new species. I took care to preserve the bones, placing them inside the skin for comparison with others. Birds of gay plumage unknown to me were shot daily, and on the 20th I was fortunate in procuring the new specimen which has been described by Dr. R. Bowdler Sharpe as

Calypomena hosei. This bird was making a noise resembling that of a dove. On the morning of the 25th I had the pleasure of securing a beautiful little barbet, which also had been described as a new species (*Mesobucco eximius*).

The following morning we moved our camp to 4000 feet, and brought down the specimens which we had collected to the store. On the night of October 8th a terrible storm burst over the mountain, and gigantic trees came rolling down the sides carrying all before them; the roar and crash of falling timber made one feel the necessity for great care in the selection of a spot for an encampment, as the fall of some of these huge trees carries large boulders with them, which greatly increases the danger. During the continuance of the storm we all felt very uncomfortable, and decided that it would be best for us to move our camp. Luckily we had taken the precaution to fell the trees that were near, so that we escaped injury. When morning came the storm had spent itself; the mountain stream had become a small river, with waterfalls from 50 feet to 70 feet drop. The noise of one of these near the hut made it impossible to hear oneself speak except by shouting. This stream the day before was so small that we had made spouts of bamboo to lead a few drops of water into a jar that we might procure enough to drink, while now the spray from the fall reached the hut, a distance of about 40 feet.

Early next day I ventured to climb a white sandstone cliff which was directly above us, and was rewarded for my trouble by finding many things of interest. Having scaled this by means of rattan ladders and cords, we came upon a large cave with a long ridge of overhanging rock; the soil underneath this ridge was very dry, but to the surprise of every one, tobacco was found growing in large quantities. We picked some of the leaves, which measured 6 inches across and 13 inches long. This wild tobacco, which appeared to be flourishing, was growing at an altitude of 4150 feet. The Punans, a race of people which live in the jungle, more like animals than human beings, having no houses, cut the leaves of this tobacco into fine shreds while it is still green, and then dry it in the shade. This when sufficiently cured is made into cigarettes. The Punans state that they gather this tobacco two or three times a year, and that it was originally planted by the spirits.

We passed on over great boulders and into the cave, hoping to find some nests of the esculent swallow, which are usually met with in such places. The mouth of the cave was small, and many beautiful ferns and other plants covered the rocks. I collected here several kinds of ferns which I had not met with before; these I sent to Kew. One especially noticeable had a frond 14 feet long. During the time I was looking for ferns, etc., the men were preparing torches made from the bark of the maranti tree, into pieces, of which a kind of gum is inserted, which burns brightly. We then entered the cave, which was very damp and

cold; the continual drip of water from the top, and rush of wind through the cave was very disagreeable. We searched about for some time, and found nothing but a prettily marked snake about 6 feet long, and unlike any of those of the low country. As yet I have not ascertained its name.

We afterwards came upon small bones of birds and animals, which had most probably been killed by the snake. As we proceeded further in, we found small caves and passages on either side, which gave the place a very weird appearance. Turning down one of these passages, we heard in the distance a strange rumbling sound, which caused us all to start, and waving our torches to get a better light, we went on in the direction of the noise to find out the cause. As we got nearer, the sound increased, and we stood still to listen. At this moment multitudes of bats (*Rhinolophus luctus*) flew into our faces, and for an instant we were at a loss to know what had happened. The noise continued, and on approaching a little nearer, we discovered the cause. A small stream of water, from a fissure in the roof of the cave, falling into a deep chasm below, caused a remarkable echo, which was repeated again and again along these passages. We perceived a small streak of daylight overhead, but finding no other way out, we retraced our steps to the entrance, and were glad to get once more into fresh air. We brought back some of the bats, which we had knocked down, and having climbed about 400 feet higher, commenced building another hut, which was finished before dark, leaving us time to return to the camp in daylight. It had been a successful day for everyone. Each man had shot three or four birds, and I had secured a pretty little squirrel with white ears (*Sciurus whiteheadii*).

The next day, Oct. 12th, I took the dry skins down to the store, and the baggage was moved to the new hut at 4500 feet. I returned at night after a hard day's walking, first down and then up the mountain. The new spot appeared to be well-chosen, as on this day the best collection of birds was secured, among which were the following:—Two *Alloctops calvus*, male and female; one *Artamides normani*, two males of *Pitta schwaneri*. Three squirrels, *Sciurus brookei*, and one *Calyptomena whiteheadi*.

The fauna of Mount Dulit resembles that of Kina Balu in a great number of instances, but it is a curious fact, that all the species above 2000 feet are found at a higher altitude on Kina Balu than they are on Mount Dulit. This I think can be accounted for by the fact, that Mount Kina Balu has been cleared of all the old jungle, and farmed by the natives to a height of about 2000 feet, whilst at Dulit there are no traces of human habitation within miles of the mountain. I think it is reasonable to suppose that many of the Kina Balu birds and animals, which prefer to live in the old jungle, have been in this way driven to a higher elevation.

On October 13th we climbed to the summit and found the altitude registered by my aneroid to be 5090 feet. From this spot we obtained a magnificent view of the distant mountains Mulu, the position of which is lat. $4^{\circ} 0' 15''$ N., long. $114^{\circ} 57' 0''$ E., and, nearer to us, Batu Song with its curious dome-shaped top; Kalulong standing out boldly on the right showing its two high peaks, which seemed no great distance from us. Looking over the Batang Kayan district one sees a vast chain of flat-topped mountains, with one much larger than the rest towering above them, and which I should say was probably 10,000 feet high. Mount Tamuduk, at the head of the Baram River, appeared through the mist, which prevented us from clearly distinguishing its shape. It has, however, a flattened top, and is, as far as I could judge, 7000 or 8000 feet high. The wind and mist driving past on Dulit's summit reminded us of a cold, bleak November morning in England. I spent some time in taking the position of these mountains, which I have worked out as follows:

	Latitude.	Longitude.
Kalulong	$3^{\circ} 7' 0''$ N.	$114^{\circ} 13'$ E.
Mulu	$4^{\circ} 0' 15''$ N.	$114^{\circ} 57'$ E.
Lambir.	$4^{\circ} 13' 0''$ N.	$114^{\circ} 0'$ E.
Tamuduk	$3^{\circ} 12' 0''$ N.	$114^{\circ} 33'$ E.
Pamabo Range	$3^{\circ} 1' 0''$ N.	$114^{\circ} 55'$ E.
Batu Song	$3^{\circ} 42' 0''$ N.	$114^{\circ} 37'$ E.
Subis	$3^{\circ} 48' 0''$ N.	$113^{\circ} 47'$ E.

We then began to crawl about and find our way through the moss, which covered the top of the mountain to the depth of 2 or 3 feet. Each tree had cushions of moss round it, and archways of moss met us in all directions; and everywhere was saturated with moisture. The trees are small and stunted, the highest being only about 20 feet, and about 6 inches in diameter; scanty and with very few leaves. The most striking are the casuarinas, which were growing abundantly on the bare rock, and glistening with the sunlight upon them. Here we found many varieties of *Nepenthes* of various hues and forms, and also several small and pretty flowers, amongst which I found some resembling closely our violets and primulas. *Dendrobiums* were plentiful on the trees. I was surprised to find the top of Mount Dulit was so flat, and on reaching the other side, looking down over the Balaga valley, some mountains at the head of the Rejang River were visible, but the mist had now become so dense that we could see but little. We obtained a few birds, and returned to the hut. The next few days were spent in collecting any specimens we could, amongst them a new Trogon, which has been described by Mr. R. O. Grant as *Harpactes dulitensis*. This, with *Heteroscops luciae*, was shot just below the summit, 5000 feet.

On the evening of October 16th I resolved to make our final camp upon the very summit, and next morning I again went to the top.

Passing along the ridge we pitched upon a spot that seemed favourable, and commenced making a hut, but owing to the trees having no leaves of any size, we were at a loss for materials for a roof. I had, however, brought one small Kajang or leaf-mat with me, expecting some such difficulty, and we managed to pass the night under it; the rain incessantly pouring down, and the position being so cold and wet that sleep was out of the question for any of the party.

We managed to keep fires alight all night, and sat through the dreary time anxiously waiting for daybreak. No one can form a correct opinion of what the shape of Mount Dulit really is until it has been seen from the top. It is evident that this vast table-land provides a home for many living creatures, that would not probably be found on a mountain whose sides were steep and ending in a peak.

On October 18th seven Punans, a tribe residing near the Parah River, on hearing shots, came up to our hut. These are the only natives that ever ascend the mountains of their own accord, and they only in search of india-rubber and camphor. They told me that they had been working in the jungle and recognised me the day before, although we had not seen them. I gave them presents of tobacco, etc., which they much appreciated, and they left us.

The following morning they returned, bringing with them three more, telling me that if I was collecting specimens, they would be willing to assist me with the blow-pipe, ("sumpitan"—or as they call it, "put"). They brought with them a fine monkey (*Semnopithecus rubicundus*) and a horn-bill (*Buceros rhinoceros*), which they had shot with this weapon on their way. I was very glad of their assistance, and they remained with me and procured many valuable specimens both of birds and mammals. One morning one of my Dyak hunters returned, declaring that he had heard a tiger. Being very unwilling to believe this, and wishing to convince them that no tiger exists in Borneo,* I took a Dyak and two Punans with our guns, and having walked half a mile in the direction pointed out to us, we heard a strange booming noise, very loud it is true, but not much resembling the roar of a tiger. I asked the Punans what they thought it was, and they replied "Jawi," toad. As we came up to the spot, the noise seemed to resound through the rocks, and sure enough, between the crevices, was a toad of gigantic size, bellowing lustily. As we tried to catch him, he backed further into his hiding-place until he was out of reach, and we were obliged to give up the hope of securing him; but a few days afterwards we procured a fine specimen of this toad, which measured $14\frac{1}{2}$ inches round the belly, and 3 inches across the head. It had a hard, rough black skin with warty excrescences on the back. These warts contain a poisonous

* I am not aware that a tiger has been found in Borneo, although the skull of one is reported to be in the house of a Singgi Dyak in Upper Sarawak.

fluid, some of which a Punan took, and placing it in the toad's mouth, destroyed the creature, and its skin is now in the British Museum.

I began my descent of the mountain on October 26th, and was glad of the assistance of these friendly Punans, who helped us to carry down my collection. On reaching the store, we packed up and rested there for the night. Next morning we had to travel slowly as the packages were very heavy, and stopping to rest for a short time at a deep pool beneath the waterfall, 1500 feet above the level of the sea, I found that the pool contained small fish (*Gastromyzon borneensis*) which were causing curious marks upon the stones at the bottom. These marks were produced, I found, by the fish adhering to the stone by means of a sort of sucker on its breast which prevented it being washed away by the force of the stream. We tried to catch them for some time with our hands, but without success, when an ingenious Dyak produced a piece of thread, which he tied on the end of a stick, and with a small piece of brass wire which he bent into a hook, it looked as if he meant business. We then searched for worms but found none. The Dyak, however, was not going to give up so easily, and sitting down on a stone, he proceeded to take out his knife and cut small pieces off the sole of his foot! with which he baited the hook, and was not long before he landed a fish, which was, doubtless, unable to resist so tempting a bait. We now all made similar hooks, and applied to our friend for bait. Having caught about half-a-dozen of these fish, I put them in spirit and continued our journey.

In the evening we arrived at the house of Aban Lia, and on going inside I found a musician seated in the middle of the verandah surrounded by an audience of about forty persons. The instrument which he was using was a flute (*silingut*) made of bamboo, on which he played not in the usual way with his lips, but through his nose! The notes produced were softer and clearer than the ordinary flute (*ensuling*) which is played with the mouth, and the man was certainly a skilful performer. Finding, however, that much of his wind escaped through the other nostril, he tore out the lining of his pocket and blocked the offending outlet with a small plug of rag. He assured me that his nose, which was undoubtedly a musical one, was slightly out of order, as he had only just recovered from an attack of influenza, but that sometimes he was able to move his audience to tears.

Next day we paddled down river over the rapids, and continuing our journey through the night, arrived at Claudetown on the evening of the following day, having spent a very enjoyable, and on the whole successful, six weeks in the Highlands of Borneo.

The jungle products of the Baram River are, rattan, gutta-percha, indiarubber, beeswax, camphor, and edible birds' nests. The minerals found in the district are gold, cinnabar, silver, antimony, iron, coal and precious stones.

There are sixteen dialects spoken in the Banam district, the most important being Kayan, Kenniah, Punan, Kalabit, Narom, Sibop, Brunei Malay, and Malay.

I subjoin ten words as an example :—

English.	Kayan.	Kenniah.	Punan.	Kalabit.	Narom.	Sibop.	Brunei Malay.	Malay.
Wild pig	baboi .	bawi .	bakas .	bakar .	sau .	bakas .	bai .	babi utan.
Man .	dala .	kalunan	ulun .	lumulun	ideh .	ulun .	jilama	manusia.
To walk	panoh	massat	malakan	nylan .	malahan	malakau	jalan .	jalan.
A fish .	maek	siluang	luang .	luang .	futar .	enjin .	lauk .	ikan.
Dog .	asau .	asu .	asoh .	uteh .	ou .	asu .	koyuk	anjing.
Water .	atar .	sungei	bah .	fah .	fer .	bah .	aying.	ayer.
Good .	sayoh	layar .	dian .	der .	jeh .	dian .	bisai .	bagus.
No .	nasi .	naan	bi .	naam .	naan .	abi .	nada .	tida.
A fowl.	yap .	manok	deek .	lal .	sal .	deek .	manok	ayam.

After the reading of the paper the following discussion ensued :—

Dr. BOWDLER SHARPE: I have before now been asked to speak a few words on those occasions when travellers come home, and not only delight the Geographical Society with an account of their journeys, but have also been known as contributors to the national collections in the British Museum. From a naturalist's point of view, I am seldom able to speak very well of the results which attend British expeditions to foreign countries. If it is a German expedition or a French expedition we always find that the Governments of those countries consider it necessary to attach to them a competent naturalist, and I yet hope to see the English Government alive to the necessity of following the example of other nations; but, luckily for England, we possess in the service of our chartered companies and in the service of native Governments, such as that of the enlightened Rajah Brooke, young Englishmen who make up for these deficiencies on the part of our own Government: such for instance are Mr. F. J. Jackson, of the Imperial British East African Company, and Mr. H. H. Johnston, the Commissioner for Nyasaland, who has been most energetic, as most of you know, in sending from his new province to the British Museum wonderful collections of the natural history of those countries which he rules over. Here is an instance in which, thanks to the energy of an Englishman, the country does not suffer in the way of science; and we find the same result when such a ruler as the Rajah of Sarawak encourages energetic men, like our friend Mr. Hose, not only to explore the district over which he rules, but to make collections of the animals and plants of the country. This Mr. Hose has done, and although we have not heard much of it in the paper, I trust I may be allowed to have two minutes to tell you some of the results of Mr. Hose's energetic collecting in these wild countries, and the importance of them I can easily demonstrate. A few years ago a young Englishman, Mr. Whitehead, on his own account and after great difficulties, managed to ascend the great mountain of Kina Balu, high up in the north of Borneo, and from there managed to get a wonderful number of new animals, birds, and insects. We were well acquainted with the ordinary forms of animal life of the lowlands of Borneo, which are very similar to those of the lowlands of Sumatra and Java and the Malayan Peninsula; but when once Mr. Whitehead got above 3000 feet on this mountain, he discovered something

totally different, something totally unexpected—we were face to face in Borneo with a Himalayan fauna, a fact of tremendous interest. We thus found that the fauna of the Himalayas extended through the high mountains of the Malayan Peninsula from Tenasserim to the high mountains of Sumatra, and continued once more into the highlands of Java and Borneo. To Mr. Hose is due the fact that we know that this Himalayan fauna extends in the highlands of the latter island to an extent before unexpected. In this expedition, which he has so modestly referred to, he has discovered some new forms of animal life which have carried our knowledge of this Himalayan fauna much further than before. That, in a few words, I think sums up the results of Mr. Hose's scientific work. I cannot tell you of the numbers and the importance of the species he has discovered; but it so happens that one of his most beautiful discoveries has been taken for me as illustrations to one of my lectures, and I have taken the liberty of bringing some slides for exhibition.

Loriculus, or Hanging Parrakeet.—I. The connection between the Malayan, Javan, and Sumatran is easily shown by certain forms of bird-life, and *Loriculus* is one of the forms which mark the connection with the Indian fauna. These little parrakeets are no bigger than a sparrow. II. In the honey-guide (*Indicator*) we have a bird once more occurring in Borneo and the Malay Peninsula, and although it is poorly represented in these Malayan countries, it is well represented by six or seven species in Africa. III. This is one of the ordinary Broad-bills (*Eurylamus*) of the low countries, where side by side with it is found another little green bird called a *Calyptomena*. When Mr. Whitehead went up Kina Balu he came upon a splendid bird there which I called after him, *Calyptomena Whiteheadi*; but Mr. Hose, on this mountain Dulit, has not only found this extraordinary bird, but has been so fortunate as to discover another species of the genus, which I have named after him, and it is one of the most remarkable birds we know, on account of its combination of colour. The other species of *Calyptomena* are green, but Mr. Hose's has a light blue breast; and, as if that were not enough, we find on closer examination that at the side of the tail it also possesses more bright blue feathers, generally hidden by the green of the rest of the plumage, and evidently intended as an extreme form of ornament, as it is only found in the male bird. In these few words I hope I have shown you that, in addition to the geographical discoveries, Mr. Hose has also contributed greatly to our knowledge of the fauna of the country he has travelled over.

The PRESIDENT: I think we have had a very agreeable evening. We are extremely obliged to Mr. Hose for his paper, and to Mr. Seebohm for having read it. Mr. Hose has also introduced a very admirable innovation by exhibiting his skill upon various musical instruments. I am afraid we shall not be able to insist upon all the readers of papers also playing the organ. Mr. Sharpe's remarks were, as they always are, very much to the point, very informing and very valuable. You will, I know, desire me to thank every one of the gentlemen I have mentioned in your name and in my own.

Mr. HOSE'S MAP.—The coast-line of the map has been taken from the latest Admiralty charts. The summits of the principal mountains have been verified by Mr. Hose and the position of others obtained by bearings and distances. The rivers and paths have been inserted from sketches made by Mr. Hose on the spot when frequently travelling over the same ground. All the positions given in the paper have been embodied in the map.

EXPEDITION UP THE JUB RIVER THROUGH SOMALI-LAND, EAST AFRICA.

By Commander F. G. DUNDAS, R.N.*

THE River Jub, which I navigated in 1891 for 400 miles, discharges its waters into the Indian Ocean, on the East Coast of Africa, in lat. $0^{\circ} 14' S.$, long. $42^{\circ} 38' E.$, almost on the Equator. Its lower course is in a southerly direction; the upper part of the river has not been explored. It probably rises in the mountainous region of Abyssinia. As it is the actual boundary between the British and Italian spheres of influence in East Africa, it is of considerable interest, as also in connection with the ill-fated expedition of Baron von der Decken. In August, 1865, he ascended this river in his steamer the *Guelph* (having lost one steamer on the bar at entrance) to the rapids above Bardera, where the vessel was wrecked, and the Baron, with five of his European colleagues, was murdered by the Somalis, two only effecting their escape. No further details have ever transpired in connection with the fate of this expedition, I being the first European who has been to Bardera since the catastrophe. The narrative of Von der Decken's expedition is well known. I hope during my recent journey that I have added something to the present knowledge of this highway to the populous districts of the Gusha territory and the rich tracts of the Boran country.

Colonel Chaillé Long, on behalf of the Egyptian Government, is reported to have made the ascent of the river for some 100 miles; but although Von der Decken's expedition was remembered and spoken of by the natives on the river, nothing was known of any other European having ever been seen. I may here recall the fact that I commanded the expedition fitted out by the Imperial British East Africa Company for the exploration of the River Tana, and the unexplored region about Mount Kenia in 1891, an account of which was read before this Society in a Paper compiled from my Journal by Mr. Ernest Gedge in April last.

Whereas the course of the Tana is almost entirely confined to the countries of the Wapokomo and Wakamba tribes, who are quiet and peaceful, the River Jub flows through the territories of the powerful and hitherto dreaded Somalis.

The stern-wheel steamer *Kenia*, belonging to the Imperial British East Africa Company, in which I made the ascent of both rivers, is 86 feet in length, with 23 feet beam, drawing 2 feet 6 inches loaded, having six compartments, with an upper deck, and deck houses fitted with wire

* Read at the Evening Meeting of the Royal Geographical Society, December 19th, 1892. Map, p. 288.

gauze mosquito frames, and an awning deck over. The armament is two new pattern Maxim-Nordenfolt guns.

We arrived off the bar in tow of ss. *Juba* on April 25th, 1892. This was the second attempt, as the weather, through the unusual strength of the north-east monsoon, was very bad; and the vessel nearly foundered on the first occasion. We now succeeded in crossing the bar, which, owing to the necessity of a vessel being exposed broadside on to the heavy rollers, is most difficult and dangerous. There is a depth of only one fathom at high water, which varies but slightly with spring and neap tides. The numerous sharks and crocodiles about testified as to the fate which might have been expected had the vessel struck. Turning into the river from a north-east to south-west course in calm weather we found a broad majestic stream about 250 yards wide, with a current running $2\frac{1}{2}$ knots, though at the narrow entrance it was much accelerated. The right bank was all low sand-hills, with a few bushes; the left wooded, with high red sandstone hills in the rear, studded with thorn bushes. On the bank were piled up trees and snags brought down by the current and lying in masses extending some little distance from the river.

Passing up in the *Kenia* I arrived at Gobwen, a small village $2\frac{1}{2}$ miles from the mouth, having two very ancient Arab forts almost in ruins, one on either side. On the left bank parts of the old wall which encircled the village and fort still remain. The only inhabitants now are the Kirobotos, natives of Muskat, some of the Sultan of Zanzibar's soldiers who occupy these forts.

The mouth of the river, although inaccessible to ocean vessels, is distant only 10 miles from the safe harbour of Kismayu, with which it can easily be connected by an inexpensive tram-line. Kismayu Bay was surveyed by Captain Wharton, of H.M.S. *Fawn*, in 1874-75. It is especially important as being the northernmost and only harbour along the entire eastern Somali coast available for ocean steamers during the south-west monsoon, which blows from April to October. During this period the northern parts of Brava, Merka, and Magadishu are closed, and trade, consequently, with them entirely suspended.

* The personnel of my expedition consisted of twelve Zanzibarris (the crew), one Goanese engineer, one Hindu, and one Chinaman (carpenter); twelve Askaris (native soldiers undrilled), and fifteen native porters for cutting and carrying fuel. I arranged to make a start up the river on May 2nd, but before that date received intelligence from the Arab Akida of the fort that the Somalis were massing all round, and that evidently something was about to happen. I had noticed for several days the hills in the distance covered with black moving masses of natives. On the morning of the 2nd, having ordered steam at eight o'clock, I saw both banks and neighbouring hills one black mass of Somalis, somewhat relieved by their white cloths, all

armed with spears and the short stabbing knife which every Somali carries. Large bodies were to be seen moving through the bush and thorn trees, coming abreast of the vessel, chanting a kind of dirge which I understood afterwards was their war-song. Still I had no communication with them. My Arab *serang* rushed up on to the awning-deck to me, saying all the crew had deserted. Then I descried two canoes arriving at the bank with my men, who were kneeling or grovelling on the ground kissing the Somalis' feet in abject terror. Of my caravan camped on the bank, all had bolted except the headman. Seeing several chiefs together seated under a thorn-tree I landed in a canoe, and going up to them asked what was the cause of all this trouble, and why all these people had assembled. They informed me that I was to take the ship out of the river, as no leave had been given for a vessel to come in. If I moved they said there would be war, and they would kill me.

I learnt afterwards that 400 Somalis were stationed, concealed in thick bush, at the bend of the river, where the water was shallow; and they expected the vessel to ground, when they would have attacked her. Eventually after much talk, I agreed to remain fourteen days, and they on their part consented to forward a letter from me to Murgan Usuf, the Sultan of the Ogaden Somalis, who was the head chief, and lived at Uffmadu, six days' journey from the coast. On the fourteenth day I received a reply from Murgan, saying that he was coming down to see me with a large following of 6000 men, and that I must feed them. I replied that I would be glad to see him, but that having no food he had better leave his retinue behind him. I then went down to Mombasa to see Mr. Ernest Berkeley, the Administrator of the Company, who returned with me. Aided by his admirable administrative capabilities, and untiring zeal and tact, I succeeded in concluding a peace with Murgan Usuf, who granted permission for the vessel to proceed. That gentleman, looking round the *Kenia*, espied my sword hanging in the cabin; he said he would have that as my present to him, and quietly appropriated it along with an arm-chair which he took a fancy to. He is a tall, powerful, handsome man, exceedingly sharp, and with a remarkable memory.

On July 23rd, having laid in a large supply of wood for fuel from the piled-up trees at the mouth of the river, we started at 8 A.M. on my voyage up the river. For the first eight miles there were large undulating plains interspersed with woods and numbers of Mkono palms, the fan palms growing close to water on the bank. The depth of water varies from $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms. At noon I arrived at the first large Somali villages of Hajowen and Hajualla, situated nearly opposite each other, with populations of about 900 each. As we came alongside the right bank at Hajowen the natives crowded down to look at the vessel. The Somalis, as is well known, are a very fine handsome race,

of good physique, with excellent features; the hair is very thick and sticks out like a bush, but is parted in front. The younger girls and women are mostly pretty with splendid black eyes, but are jealously guarded by the men; a Mzungu or European is hardly permitted to look at them. The Somalis are very strict Mohammedans. I noticed numbers of Galla girls about who are slaves, the lighter colour and different features marking them out from the Somalis, who are very black. The missionary Krapf reported, in 1849, having heard in Shoa of a tribe of Christian Gallas living near the equator. It is a curious fact that many of the slaves of the Somalis, whose mothers or grandmothers were Boran women captured by the Somalis, wear, as an ornament, a white round shell or stone having a black leathern cross upon it. I am informed that when the Company's Administrator first visited Kismayu and opened negotiations with the colony of runaway slaves at Gosha, he then heard of a Christian tribe of Gallas who were anxious to get into communication with the Company and to have access to the coast.

Leaving these villages, the only large Somali villages on the river from the mouth to Munsur, 360 miles, and Bandera, 387 miles, I went on up the river. The country still showed large grass plains with occasional wood. Later in the afternoon, seeing large herds of game feeding, I made fast to the bank, and going after them was fortunate enough to secure two Topè, a very large species of reddish antelope with sloping horns. The meat was excellent.

The next day, Sunday, we pushed on, the river mostly running through wooded reaches and jungle. Seeing as I thought another river running nearly parallel about a quarter of a mile off, I landed and went over to it, and discovered that I had passed through it just three hours before. This will show how winding the course of the river is in this part. At nights, when the lamp was lit on the upper deck for dinner, the table and deck overhead near the light was simply a mass of insects of every description: large moths beautifully marked, numberless extraordinary animals with gigantic feelers, earwigs and gnats. As a rule, I am glad to say, there was an absence of mosquitoes.

Thick wood continued on both sides with occasional openings, at which we saw numbers of natives of the Waboni tribe, who live mostly by hunting. They are dressed with a piece of skin round the loins, and armed with bows and arrows. The trees were full of monkeys of every description, from the smallest to the largest-sized baboons; they seemed somewhat curious about the vessel, but did not appear in the least to be scared. Several white-headed eagles with numberless crocodiles made up the only game to be seen, the grass plains at the back not being visible. Several large snags in the river showing above the water with the sweeping current made the navigation somewhat

difficult, more especially as I had to take all the angles at the different bends for survey, occasionally anchoring to ascertain the strength of current with the patent log. Not one of the natives shipped as crew ever having been afloat before gave me sufficient work to keep me on the alert every moment when under weigh. As we ascended, the bends in the river became wider and more sweeping. I observed groups of the castor-oil plant, almost choked with the extraordinary luxuriance of creepers and undergrowth.

At 10 A.M. on the 25th we entered the Gusha district, the Shambas or cultivated lands commencing on the left bank. The inhabitants of Gusha some thirty or forty years back were solely composed of runaway slaves. Now the population has increased to an enormous extent. Where formerly there were a few villages now there are small towns with populations varying from 600 to 1000. They live entirely on the proceeds of cultivation. The clearings in the forest are first made by firing all the bush and lighting a fire at the foot of the trunk of each tree, which is left to smoulder. After a few days it comes down with a crash and a shower of sparks, and lies where it falls; but the land around is tilled and sown mostly with Mahindi (Indian corn), which is the staple food, mtama, sem-sem, a small brown grain which is crushed for oil; cotton and tobacco are also grown. These dead trees, which are to be found through the whole cultivated district for a distance of 100 miles, give remarkable facilities for obtaining fuel for steaming. The dead wood is quite dry and burns admirably, in many instances not even requiring to be cut into lengths. I may add that from the mouth of the river to Bardera I never had to cut a single tree down for firewood.

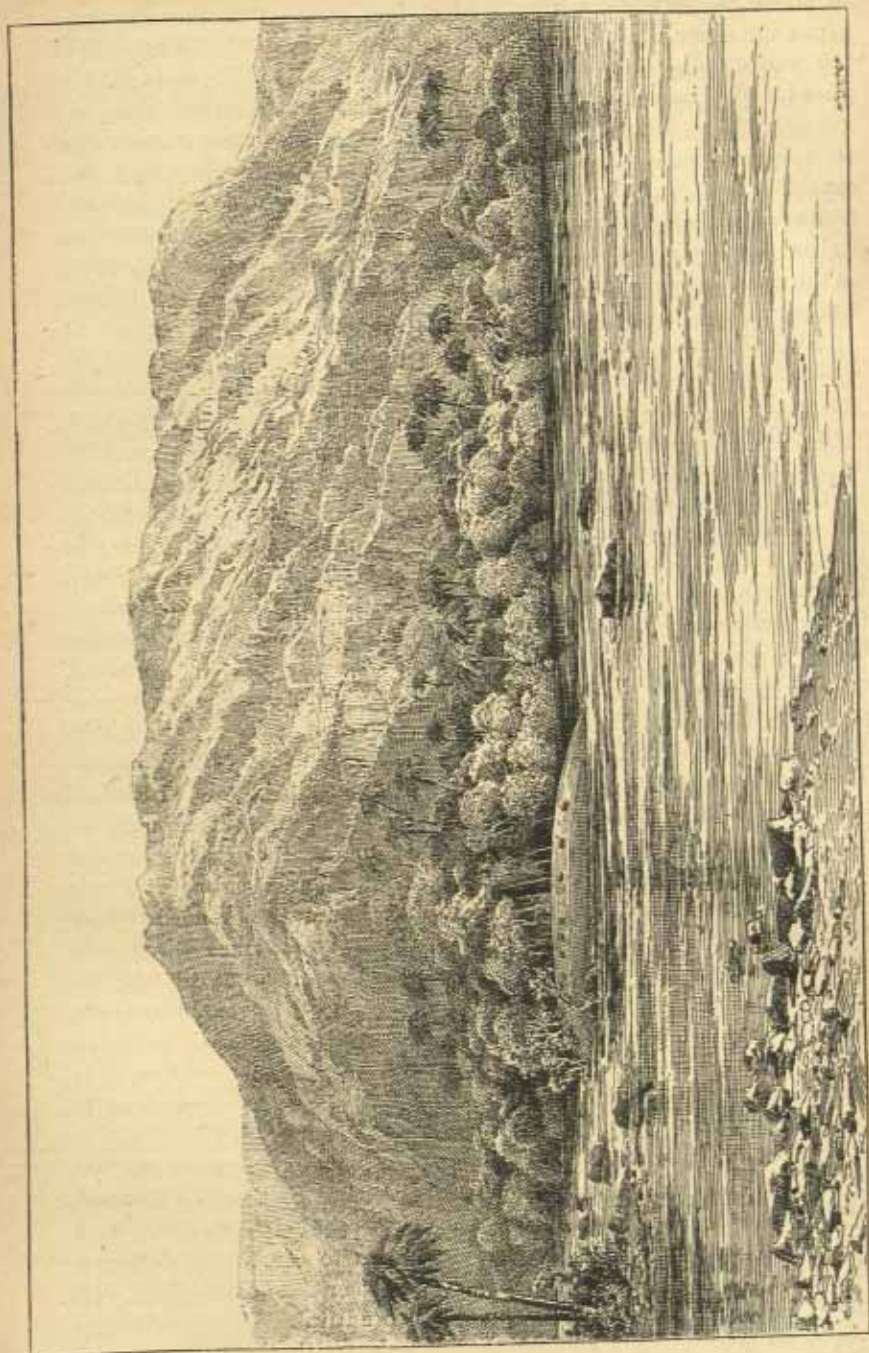
On arrival at a large island formed by the river forking I was perplexed as to which route to take, and which was the river proper. At length I took the north-east branch, which afterwards proved to be the right one, and arrived shortly at the village of Mataku. I was here told that the other arm or fork would join again some distance farther on, but that it was narrow and full of snags, with tortuous bends. The arm of river which I had taken was also most difficult to navigate. In many parts it was only 15 to 20 yards wide, with dense overhanging trees and branches standing out; thus for several hours we were constantly colliding with the trees, the swift current sweeping the vessel in amongst them risking the loss of the funnel and of the awning deck. I may here add that when it was requisite at any time to turn the vessel, she being 86 feet in length with 23 feet beam, the bow or stern had to be pushed into the jungle, leaving one end in the river which the current acted upon. It was an everyday incident for the vessel sometimes almost to disappear into dense masses of vegetation and creeper, which grow very thickly, and hanging from the lower branches makes

an almost impervious barrier. After four hours' steaming we again joined the other arm of the river, and it then opened out to a breadth of 120 yards. The first large village of Tula on the right bank was passed. The natives were out *en masse* to see the vessel pass, the women running along the banks uttering low peculiar cries, commencing on a very low note, and ascending to the highest each lady was capable of producing. Several more elderly females, having three and four small infants tied up in the mother's cloth and secured round their bodies, were careering along the banks, every now and then appearing at the openings in the high grass. How the young urchins escaped coming to grief I cannot conceive.

At length we arrived at Fuleile, the village where the Sultan of the Gusha district (Nasibu Mpondo, as he is called), resides. He is a tall, fine, powerful man, and at once came off to visit me, expressing his delight at seeing the steamer. He begged me not to go to Bardera, as he said the up-country Somalis were very bad, and would assuredly kill me. He said that he and all his people were the friends of the European. Throughout the whole Gusha district the Swahili language is spoken. From this village to Bilo there are numerous very large villages densely populated, and the banks on either side continuously are more or less cultivated, the cultivation extending in many instances several miles in from the banks. Very little wood is now seen, the country being a flat plain and excellently adapted for cultivation. Large groves of bananas and plantains were now frequent on either side, and as the *Kenia* moved along, hundreds of natives were to be seen at work in the Shambas. They nearly all dropped the jembe, a small flat iron hoe with handle with which they till the ground, and hastened to the banks to see the wonderful phenomenon in the shape of a steamer. Those villages which I passed on the way up (as I wished to get on as fast as possible for fear of the water falling) I called at on the way down, and made friends with all. At the village of Jelib I saw cotton growing, which was picked by girls, several twisting it on to improvised reels. A man was weaving with a wooden loom and shuttle, very primitive but ingenious, of native make. The man sat in a hole working a double treadle, and wove cloths of excellent texture, which were worn by the natives. On inquiry I learnt that not one from the village had ever even been to the coast or seen a white man.

It is estimated that the number of runaway slaves settled in this colony now numbers from 30,000 to 40,000 souls. They have expressed great delight at the advent of the Company, and have eagerly placed themselves under its protection. They hope now to find at Kismayu an outlet for the superabundance of grain they can raise in their very fertile district. There is a promising future for trade with these people, both in the export of grain and import of Manchester cottons.

Above Bilo, which is just 100 miles from the mouth, there was



RAPIDS ON THE UPPER JUBA RIVER, WITH REMAINS OF VON DER DECKEN'S STEAMER.

dense impenetrable forest on either side. We arrived at the point where the Jub, in its downward course, forks. One branch runs off from the main river on the right bank to the south-west. I believe this may be the origin of the Sheri, which, as is well known, flows southward, and empties itself at Port Durnford, 80 miles down the coast midway between Lamu and Kismayu. Mooring the *Kenia* alongside the bank I explored this branch downwards in a small boat for 20 miles. It was from 3 to $3\frac{1}{2}$ fathoms deep, with a current of $3\frac{1}{2}$ knots. There was dense forest on either side. The stream was so narrow that branches of trees in some places projected nearly across; it was, in consequence, quite unnavigable for the *Kenia*. From the depth of water and large volume coming from the main river, I assume that it flows for some distance, and with this theory all the native accounts agree, as they said it went to the big water (the ocean). I shot two large crocodiles 14 and 16 feet in length; and from the depth of scale one must have been very old. I stopped at a small Waboni village where the people lived almost entirely by fishing. Fish of several kinds were plentiful in the river. One was as large as a salmon, but with an enormous head and teeth. Numbers of large turtles, from 30 to 40 lbs., were also caught in the Jub with a strong hook and line. I have often had turtle soup and wild duck for dinner when in the river.

On leaving the Sheri, the *Kenia* proceeded between wooded banks to the village of Mfudo. This is one of the last runaway slave stations. The clearings in the forest were still being carried out, and shambas were not yet formed. The forest on either side extends for about one mile, and then thick thorn woods for another three-quarters of a mile, when you emerge on the vast undulating grass plains so common to African scenery. I had some excellent shooting at Mfudo, the headman, Shongolo, being a capital hunter. I landed on the opposite bank several times, and, following a small track through the forest, came out on to the plain. I saw several magnificent ostriches, but never could get within 500 yards, there being no cover. Even after crawling in the hot sun I failed to get within reach, for their scent or sight was too keen; suddenly they would look round and dart away, just moving their wings and not stopping for several miles. Vast herds of buck, topè, kuguni, wildebeest, and smaller kinds of antelope enabled me to make several large bags, once including a rhinoceros.

On July 29th we came to the last settlement of the Gusha people called Shonde. There were only about thirty people in all, and they had lately arrived from one of the larger villages to establish a settlement and clear the forest for cultivation. On either side after this it was dense, primeval forest. The scenery was beautiful. There were thick green masses of foliage against the blue sky, with the brown, muddy river running silently on without a sound, except the stroke of the

stern wheel or the occasional splash of a crocodile disappearing off the bank into the water on the approach of the vessel.

The trees are mostly of the acacia kind, the African oak, with tamarinds and numbers of green thorn trees, etc. I was struck by the large masses of purple convolvulus intermixed with the thick network of creeper which cover most of the trees, forming one serried mass of foliage. Through a small opening, by a stream running off from the left bank, I made my way by canoe into a large lake having no outlet. In the black alluvial soil of the river I saw several sparkling grains of metal like gold-dust. I washed samples of it, and the grains of metal still appearing, I put some in a bottle for transmission to Mombasa, but have not yet heard what it might be. The probability is that it is not gold, but pyrites.

For several days now the dense forest continued without intermission. Numbers of hippopotami were about, and I secured several. Thick fogs in the mornings hung over the river until eight o'clock, when the heat of the sun dispelled them. The average heat in the river was 90° in the shade during the day, and 83° at nights. The monsoon at times blew very strongly, which made the nights much colder; but the temperature during the day never varied. The general depths of the river so far was from $1\frac{1}{2}$ to 3 fathoms.

On August 2nd, after five days steaming through forest land without seeing any sign of human life, we suddenly emerged into the open, and arrived at the village of Kabobe. It is inhabited by a very mixed race, consisting of Somalis, Gallas, Swahilis, Wabonis, and Kabyles. The chief, Taiu, after a little time was very friendly, and the vessel created the greatest excitement, hundreds of natives standing on the bank alongside day and night. There were numerous shambas, and the people here lived partly on the produce of land and partly by hunting. Sweet potatoes, bananas, mahogo, cheroki, and koondi, a kind of bean, were to be obtained in profusion. I had two days' shooting on the left bank, and obtained several Kuru or water buck.

The river rose 18 inches in one night. From all the information on this point which I could gain it would appear that during the months of August and September the water rises suddenly, and in a week or ten days falls again with the same rapidity, this taking place several times during these months. Twice this sudden rise and fall came under my own observation. The natives told me it was caused by the rains far up country bringing the freshets down; but comparatively little rain fell over the expanse of country through which I passed. The chief here told me that the river is in flood part of July, August, September, and October; it falls rapidly in November, when it is possible to walk across the bed. In December and January the water is very low; in February it rises, and is partially in flood during March and April, when it falls again, rising in July.

On August 4th we left Kabobe. The features of the river altered somewhat, the reaches being wide and shallow. The vessel grounded on sand-flats, but came off again, the depth varying from $\frac{1}{2}$ to 2 fathoms. We passed a high slate rocky bluff, 30 feet high, sheer to the river. After some little distance the woods disappeared, and the country opened on to the plain studded with mkono palms and mimosa thorn. High flat ranges of hills rose on the north-east. From Anole, in latitude $1^{\circ} 59' 52''$ N., the banks entirely change, becoming hard and stony, with slate intermixed. A plateau 200 feet in height extended on either side for some distance with a peculiar sugar-loaf peak close to the right bank. The water was now very shoal, and the vessel grounded repeatedly. There were great numbers of hippopotami about, as many as fifteen and eighteen standing close together on a bank in the centre of the river. We passed three high rocky bluffs rising 150 feet high sheer from the river just before arriving at the large Somali village Mansur.

Here I was informed that the Sheik of Bardera had sent down to say that the European was to go back, and not to attempt to go up to Bardera, or he would be killed. He added that the only European, many years before, who had come to Bardera had been killed, and the same would happen to this one. I replied that I was going to Bardera, and wished to make friends with the sheik. The up-country Somalis have nothing to do with the coast tribes and Ogadens. From Mansur the same features prevailed.

Turning a bend we came in sight of Bardera on the evening of August 10th. The town is situated on a hill on the left bank adjoining the river. The whole of the bank was lined with Somalis, and evidently from their excited state, some trouble was brewing. The crew in terror begged me to turn back. I made the vessel fast to the right bank, opposite Bardera, the river here being 60 yards wide. I sent a Somali interpreter to speak with the sheik, but the men rushed down to the landing-place, brandishing their spears, and threatening to kill him if he landed; so I hailed him to return. Having camped the porters alongside the vessel on the right bank, I received news through some of the Barra Somalis (Somalis of the plain) that the sheik was sending a large force across some little distance up to attack the vessel that night. I withdrew the men on board, leaving the tents pitched and the fires burning, quietly pushing the vessel from the bank, anchoring in mid-stream. At 11 P.M. I saw large bodies of natives on the right bank moving about between the trees. Suddenly they dashed into the river, swimming off on both sides. Unfortunately, or let us say fortunately, my Maxim guns were useless, and could not be fired; but attributable entirely to circumstances beyond my control, and my crew were too frightened to make it safe to depend upon their rifles. When the Somalis were just clambering on board, I fired a sound signal which I had with

me, hoping that its novelty might intimidate their savage nature. These signals are fired from a socket fixed upright with a tube, and having used them a great deal on the coast in England, the thought occurred to me in Mombasa how well they might answer as a last resource with natives when used for the first time. I therefore carried several with me in my former expedition when in the Masai territory, but never had occasion to use one. On the present occasion the signal proved most effective. When it burst in mid-air with a loud explosion, lighting up the whole river with its shower of red stars, the water being black with heads, I had the satisfaction to see the natives all turn and make for the banks in terror. No further attack took place.

The next morning, knowing that some move was imperatively necessary, I landed suddenly amongst the Somalis, at Bardera, unarmed, with my interpreter. I pushed through the threatening crowd of natives to the sheik, expecting half a dozen cold spears through my back every moment, as they pressed round with their spears raised. I think the sheik was too astonished for words. I said *Aman* (peace), and told my interpreter to say I meant to do him no harm and wished to be friends. The chief at last asked me how I dared to come unarmed among them; that I was completely in his power, and that he could easily make an end of me. I said he might do so if he liked; that I cared nothing for him, but I knew I had done him no injury, and why should we not be friends. Had the Company wished to take his country I would have come with a large force, instead of which I came entirely alone. Was it to be *Aman* or not? After a few moments, apparently taken aback at what seemed my foolhardiness, he said there should be *Aman*, at least until he had consulted the chiefs. He bade me go on board and await the result. As you may guess I did wait with some anxiety, but at the end of five hours the sheik sent a present on board as a token that we were to be friends. He said he did not like white men, but he rather liked me personally. After some days we became great friends. I told him I wanted to go further up the river, to which he at first objected; but on my offering to take as many of his people on board as we could hold, or to leave some of my own, he eventually consented. He sent the second sheik with two other chiefs to accompany the *Kenia* up to the rapids, situated 25 miles above.

Bardera is an old town with remains of a wall running round it; the population is about 1200. The huts are large and clean, the inside being hung with skins and divided into two rooms. There is little or no cultivation around Bardera, and the people live principally on cattle and sheep, there being vast herds feeding on the banks. The great caravan route from the Boran country crosses the river at Bardera; by this are brought ivory and hides which find their way to Brava and the northern ports.

When navigation of the river is regularly established and this waterway is opened to commerce, the bulk of the trade now finding an outlet at the northern ports will be diverted to Kismayu. It must not be overlooked that the trade of the Somalis is not carried on by human portage, but by camels and other baggage animals, so that with the port of Kismayu permanently open the trade of the interior should be attracted to the terminal point of navigation on the river. The large annual shipment of hides from the Somali ports points to their country being an extensive pastoral one. Considerable quantities of the best grey cottons, known here as "Americani," are imported. The inferior kinds of Manchester cloths which are bartered in the Hinterland of Mombasa are unsaleable amongst the Somalis.

Logh, another large Somali town, is five days' journey from Bardera. The road passes into the Barra, and does not follow the river on account of the very hilly character of the district, with dense thorn woods. The only other route into the Boran country crosses the river at Logh. The Ganana district is several days march above Logh.

With the second sheik and two other chiefs on board I left for the rapids, the water in the river falling rapidly. Past the village of Marda the river ran between a range of steep, rocky hills, 300 to 400 feet high.

Arrived at the rapids, where the bed of the river was a mass of rocks, I made the *Kenia* fast on the right bank, near a small sand beach. Baron Von der Decken's ill-fated vessel, the *Guelph*, which was wrecked twenty-seven years before, almost to the day, was now lying close to, on her starboard side, the funnel still standing straight up, with two trees growing up alongside. I visited the *Guelph* several times, and found one side all gone, with two rocks through the bottom, which was silted up with sand and mud. The shell of the port side, with beams and davits, remained; cylinders and boilers were still in position. A large and a smaller island in the centre of the river divide it into three channels. The one off the right bank, taking a very sharp turn, is a mass of rocks; the centre channel being dry, and the other off the left bank the only possible one. But I consider it utterly impracticable for navigation, the depth varying from 6 inches to 3 feet. The current sweeps among the numerous rocks at the rate of 6 knots. I attempted to haul a small boat through, but had to give it up, she being nearly dashed in pieces. One of the Somali chiefs, a very intelligent man, told me that four hours march above the rapids the river falls over a ledge of rock; therefore if a vessel could be got beyond the rapids, through a great rise in the river, she would be stopped by these falls. I wished to have gone by land to see these falls, but the chief informed me there was no road, and it would take some time to cut through the thick thorn bush on the bank. The latitude of the rapids is $2^{\circ} 34' 45''$ N. The distance

from the sea by the river to these rapids is 407 miles, and to Bardera 387 miles. In the whole of this distance the Jub receives no affluent.

Leaving the rapids to return to Bardera on August 16th, we grounded heavily several times on the shallow sand flats, the river having fallen several inches, and parts in the centre where the vessel had passed over on the way up being now dry. We took three days to get to Bardera, having several times to clear everything out of the vessel to get her off. Remaining only one day in Bardera for fear of being stopped by want of water, and leaving the sheik and his people on the most friendly terms, I started to make the descent of the river. For days the *Kenia* was on shore on different sand-banks, and the work of clearing her out of all stores, and transporting to the bank by one small boat in the strong current, was very heavy and hazardous. However I succeeded in getting her off, and, after running numerous risks from the strong current and very sharp bends at different points in the river, at length we arrived at Gobwen on September 20th, near the mouth of the river, after two months' absence. Here I was told that news had been received on the coast a month previous that the *Kenia* was broken up, and the European killed, the crew being made slaves of by the Somalis. The fact that part of the light casing of the *Kenia* had been broken off colliding with some of the trees and actually floated down the river 250 miles, when it was picked up and forwarded to the Superintendent at Kisumayu as evidence of the destruction of the vessel, naturally caused some credence to be attached to the story prevalent on the coast.

The Somalis are a fine race, extremely proud, and would not on any account show the slightest astonishment at anything; no expression of wonder ever passed across the face even when I showed them the engines, the Maxim guns, and a revolver. Their dress is a white cloth, 7 yards in length, $2\frac{1}{2}$ in width, of broad Americani or drill, which is wound round the body and the end thrown over the shoulder. The women of Bardera, in addition to the white cloth, have a Kanaki cloth of dark blue or black over the head, and wear white leggings from the knee to the foot over sandals, which does not enhance their personal appearance. The men are all armed with the long spear, small round rhinoceros-hide shield, and short stabbing knife. Nearly the whole of the Somalis I met are strict Mohammedans, and are most particular, especially in Bardera, to pray at sunrise and sunset. My position, on account of the fanatical Mohammedanism, was a somewhat perilous one, as I was looked upon as an infidel, and the sheik said that for this reason it would be unsafe to go about, as it would take some time before his people could become habituated to seeing a European in Bardera. The grasping nature of the Somalis is very observable; no matter what was given in the shape of a present they invariably wanted more.

The second sheik and two other chiefs whom I had on board for several days were most observant and anxious to know about everything, asking numberless questions. They eat a great deal of meat, but the favourite dish throughout Somali-land is coffee-beans stewed in ghee—a kind of rancid fat.

The climate is excellent; not a single case of fever occurred during my stay in the river. This I attribute to the dry heat and to the fact that the river does not overflow its banks, as the Tana does, creating vast malarial swamps. In that river the clouds of mosquitoes at night made life unbearable. In the Jub River it was an exception to find many mosquitoes, and most of the time a curtain could be dispensed with. The country is admirably adapted for cultivation and European enterprise, in the Gusha district, the ground being very fertile and the people glad and willing to receive Europeans and trade with them. I hope that as the river has now been ascended without bloodshed, the way will be open to further communication, and that peaceful trade—the great object of a chartered company—may soon follow. The *Kenia* remains in the river, and is ready for another ascent when the directors of the Imperial British East Africa Company consider it desirable.

After the reading of the paper the following discussion ensued :—

Captain WHARTON: When my old friend and shipmate Captain Dundas wrote to me from East Africa to say he was going up the Jub, I must say I thought there was a very great chance of never seeing him again. I had seen a little of the Somalis on the coast in 1877, and formed a very strong opinion that if the Somalis were determined he should not get up the river he would not do so, and as all previous experience had shown that that was their general line of action, one's mind could not help coming back to Von der Decken's ill-fated expedition. The preliminary difficulty at the bar I did know of, as I observed it when passing near the mouth of the river, but I did not try it, for it is about as nasty a bar as ever I saw, for getting over with a ship broadside on to a rolling sea is very difficult. Captain Dundas has opened up a new line into the country without bloodshed, and by a mixture of audacity and jolliness, which always goes down with the African, even though he be a Somali, not quite so amenable to laughter as other Africans, has added something to African exploration which I hope will be for the benefit of the British East Africa Company and England generally.

Mr. RAVENSTEIN said that Captain Dundas's survey of this important river agreed in the main with the survey made during Von der Decken's expedition. Captain Dundas was most certainly the second European who had reached Bardera, although several claims had been advanced to that honour. Mr. Henry C. Arcangelo, who read extracts from his diary before this Society in 1866 (*Proceedings*, x. 1866, p. 113), and published several papers in the *United Service Magazine*, claimed to have ascended the river in 1836, for a distance of 240 miles, but inquiries made by Captain Guillaïn at Gobwen clearly showed that that gentleman never got further than that place, and returned thence to Barawa. In 1853, a Captain J. H. Short told Mr. Macqueen that he had gone up the river for 210 miles, and that he saw snow-clad mountains far away to the westward. These mountains, however, had not been discovered since (*Journal*, R.G.S., 1860, p. 134). More recently, in 1875, an Egyptian expedition had been despatched to the east coast of Africa on the

proposition of General Gordon, with instruction to take possession of Mombasa with a view of establishing communications with Uganda. Colonel Chaillé Long, who had just published a very entertaining book on Egypt and the Sudan, was attached to that expedition, and claimed to have ascended the river for 150 miles in a steam-launch. More recently still, an Italian, Captain Ugo Ferrandi, had approached Bardera by land, but had not actually entered that town. But whatever degree of credit might be given to these various claimants, there could be no doubt that for our actual knowledge of this river, excepting of course its mouths, we were indebted to Captain Dundas and the expedition led by Baron von der Decken. Captain Dundas had not been able to visit Logh or Ganana, which latter, we now learnt, lay on a different arm of the Jub, but he had thrown some light upon another interesting question. It had been asserted that the Jub, after the rains, discharged branches, which were lost in the sands, formed backwaters, or even reached the sea. Captain Ferrandi believed that he had crossed such a branch (dry at the time) which he was told entered the sea to the east of the present mouth of the Jub. Natives had spoken of similar branches which filled a number of lakes in the Wama country, apparently a most interesting region at the back of Kismayu, which it was to be hoped would be fully explored at an early date by an official of the B.E.A. Company. Captain Dundas had not observed any of these lower "outlets," but he had actually navigated a river flowing out of the Jub in the direction of Port Durnford. It was not likely that this outlet actually reached that port. At all events, here was an interesting subject to be elucidated by future explorers.

The PRESIDENT: We have listened to a very excellent paper from Captain Dundas—admirably illustrated. I observed that you received with particular pleasure some accounts he gave of his personal experiences, and I am not surprised, for I hardly ever heard a better illustration of the happy phrase of one of our poets: "The calm, open-eyed rashness of Englishmen born." You will, I think, give your most cordial thanks to Captain Dundas, and include in them also the Hydrographer to the Admiralty, who speaks with so great an authority on every subject upon which he addresses us, as well as Mr. Ravenstein, whom we know as so accomplished a geographer.

Commander DUNDAS'S MAP.—The general map of the River Jub, and the chart of its mouth, have been reduced from Commander Dundas's own maps. The sketch of the coast between Kismayu and the mouth of the Jub is intended to show the line of the tramway which it is proposed to construct from Kismayu to Gobwen.

RECENT EXPLORATIONS IN THE SOUTH-EASTERN CONGO BASIN.*

By E. G. RAVENSTEIN.

THE vast territory of 250,000 square miles forming the whole of the south-eastern portion of the Congo State, which was "conceded" in 1891 to the "Katanga Company," has recently been explored by several Belgian expeditions, fragmentary reports of which have appeared in *Le*

* Map, p. 288.

Mouvement Géographique, accompanied by skeleton maps.* We have combined the information supplied by our contemporary with the results of previous explorers, including Commander Cameron, who was the first to drive a trunk-line through Urua; Reichard (1884), the first educated white man who visited Msidi's residence at Bunkeya; Messrs. Capello and Ivens (1884); Mr. F. S. Arnot (1886-8), who founded a missionary station, still occupied, near Bunkeya, and Mr. Alfred Sharpe (1890).† The map produced must be looked upon as quite provisional, for discrepancies in the statements of these explorers can only be cleared up when the full reports of their work shall have been published.

The first of the expeditions with which we propose to deal is that of Lieutenant Paul Le Marinel, who left Lusambo, on the Sankuru, on December 23rd, 1890. He first of all followed the Lubi for about 100 miles. He found it to be a rapid river, about 80 yards wide at its mouth, and not navigable. The country has a dense population, for up till now it has been spared the visitations of slave-raiding Arabs; the inhabitants own cattle, sheep, goats, pigs and poultry, and cultivate bananas, manioc, ground-nuts and sweet potatoes. They dress their hair in the most grotesque fashion, and paint their faces and bodies. Their only arms are long spears. At Chikunga (6° 4' S., 2560 feet) the explorer left the Lubi and entered Kanioko, which extends thence to the Lubilash. The Balungu, who inhabit this country, have made some advance in civilisation; their agricultural products are of the most varied character, and they live in comparative comfort.

The Lubilash, where crossed (7° 58' S.), was nearly 100 yards wide, about 10 feet deep, and of sluggish current. The country of the Kalundwe on its eastern side is fertile, densely peopled, and traversed by broad, carefully-kept roads. The Babondo, further south, live in stockaded villages, at constant war with each other. Going still further south M. Le Marinel passed close to the swamp which gives birth to the Lomami, and ultimately reached a miniature lake region in Usamba (Samba), described by him as a beautiful country, with fine trees, short and luxuriant grass, huge ant-hills, and an abundance of game—including elephants, buffaloes, antelopes, zebras, lions and leopards.

Proceeding eastward towards Bunkeya, the explorer crossed the Lubudi and then the Lualaba (9° 54' S., 2620 feet), beyond which he came through the country of the Bena Kalambo, who inhabit small stockaded villages, and in time of danger retire to caverns in the Kanke mountains. Easterly winds prevail in these mountains, and the cold

* More especially the numbers for April 3rd, November 13th, and December 14th, 1892.

† The first "white" man who visited Urua appears to have been J. B. Ferreira, of Bihe (1871).

at night is occasionally very sensible. Clay-slate and various schists are the prevailing rocks, iron-ore abounds, and a wild vine grows bearing blue berries. On April 18th, Lieutenant Le Marinel arrived at Msidi's capital, which at that time had a population of six to nine thousand souls. Having established his companion Legat in a station built to the east of the Lufira, the leader of the expedition returned by a more northerly route to Lusambo, where he arrived on Aug. 11th, together with Mr. Swan, of Mr. Arnot's mission, who had joined his caravan.

Of the three expeditions despatched in 1891 by the Katanga Company, that led by M. A. Delcommune was the first to reach Bunkeya, Msidi's capital. This expedition left the residence of the "Arab" slave-hunter Gonga Lutete, on May 18th, 1891. Its members included Lieutenant Hakansson, Dr. P. Briart, and M. Diederich, a mining engineer. It successively passed through Lupungu's stockade, Moïna Goïo, and quite a number of Luba "street-villages," one of which had a length of 5 miles. The Lomami was crossed in lat. $7^{\circ} 31'$, and on July 19th the expedition arrived at Kilemba Museya's, who is both son and nephew of Cameron's Kasongo Kalombo. After a visit to Lake Moryo, to the north, and to the lake region of Usamba, far to the south, M. Delcommune started for Lake Kasali, which he reached on August 27th. In skirting that lake he passed through Kikonja, where Lieutenant Hakansson and twelve men of the rear-guard were killed by the Baluba. The Lualaba was crossed near the Lovoi confluence, where its volume was 890 cubic feet a second, thus proving it to be inferior to the Luvwo, Eastern Lualaba or Luapula, which in the same month of the following year was found to discharge 1830 cubic feet a second at its outflow from the Mweru.

M. Delcommune, in his subsequent journey to Bunkeya, made his way partly along the valley of the Lufira, partly over the Kibala mountains, and reached Msidi's capital on October 6th, 1891. Msidi, by that time, had become a "lion grown old." He was very desirous that his visitor should assist him in his conflicts with the revolted Basanga; but M. Delcommune very wisely refrained, and prosecuted, instead, the exploratory work with which he had been charged. Having moved to the station on the Lufoi founded by his predecessor, he started in November for the copper mines of Katanga and Ntenke. A very difficult march took him thence to Musima on the upper Lualaba. A fearful famine reigned in the land; the country was absolutely deserted, and his men had to live on mushrooms and wild fruit. Many of them died by the road. At Musima he built boats for a descent of the river—a tedious task, as trees of suitable size were rare in that grass-land. A start was made at length on February 25th, 1892. The river was about 60 yards wide with a volume of only 200 cubic feet a second. It was full of rocks and rapids, which necessitated frequent

portages, and ultimately, after having traversed a stretch of smooth water, M. Delcommune found himself stopped by the Nzilo Falls, where the river pours over a wall of rock down into a narrow gorge 1000 feet deep. The leader of the expedition very bravely attempted to overcome this obstacle by dragging his boats overland; but as it took him a month to advance 10 miles, and as an excursion to the Lufupa clearly demonstrated the impracticable nature of the country, he reluctantly gave up his task, and returned to Bunkeya, where he arrived on June 8th, 1892. Finally he turned north-eastward, and joined Captain Joubert at Mrumbi (Baudouinville) on Lake Tanganyika on August 20th. When last heard of M. Delcommune was with Captain Jacques at Albertville, and he intended, notwithstanding the disturbed state of the country, to effect an exploration of the Lukuga River.

The second expedition was led by Captain W. G. Stairs, who was accompanied by Lieutenant Bodson, the Marquis de Bonchamps, and Dr. Moloney. As an account of this expedition will probably shortly be furnished to the Society, we confine ourselves on the present occasion to a few notes. Captain Stairs left Bagamoyo on July 4th, 1891, for Karema, on Lake Tanganyika. He thence crossed the lake to Mrumbi (Captain Joubert's station), and started from that place on October 31st for Bunkeya, following, in the main, the routes first traversed by his predecessors Reichard and Sharpe. On November 19th he crossed the Eastern Lualaba, or Luvwa ("river"), at Ngwena, a place two days' journey below Mpweto's. The river there is 300 yards broad, and quite unnavigable owing to its inconsiderable depth (not exceeding one foot in some places), the rocks which strew its bed, and a number of rapids. Even in the rainy season the river does not rise more than 30 inches. Its wooded islands are occupied by villages.

Captain Stairs arrived at Bunkeya on December 14th. Six days afterwards his companion, Lieutenant Bodson, shot Msidi in self-defence, but was himself shot by one of the attendant chiefs. For nine months past Msidi's ephemeral "Empire" had been a prey to civil war, provoked by the chief's rapacity and cruelty. Many villages had been destroyed, and entire districts abandoned by their inhabitants. The fields had remained untilled, and thousands fell victims to famine. Captain Stairs, immediately after Msidi's death, summoned the chiefs, and they willingly accepted the flag of the Congo State. Mkande Wantu was appointed chief of Bunkeya, but the "Empire" of the Garenganze was a thing of the past; it had not endured even for a single generation! On January 30th, 1892, Captain Bia arrived at Bunkeya, and Captain Stairs, whose health was failing, was thus able to leave for the coast, but he died at Chinde, on June 8th, on the eve of his return to Europe.

Captain Bia, the leader of the third expedition, had associated with him Lieutenant Franqui, Lieutenant Derscheid, Dr. Cornet, and Dr. Amerlinck. The *Princesse Clementine* carried the leader and his

companions from Lusambo to Pania Matumba, Kachich's residence, on the Sankuru, which, above the falls discovered by Dr. Wolf, is known as Lubilash. They then proceeded by land, following the river for about 100 miles, as far as the confluence of the Luembe. The Lubilash is not likely to prove a very serviceable waterway, for it is shallow and fordable throughout. Up to where it receives the Kashimbi it follows a winding course through a broad valley bounded by wooded hills; next follows a wooded savannah, and higher up still the grass-land, with which travellers in Africa are familiar, where trees are found only in the ravines and round the villages. In the north the country had been laid waste by the Arab slave-hunters, but further south the Baluba dwelt in large villages, and cultivated manioc, maize, and bananas. The villages were not stockaded, the natives had but few guns, and were friendly.

The Luembe (Luwembe), which the expedition followed for twelve days as far as Moigonka (3420 feet), takes its course through a fertile valley. It is of considerable depth, in places, but its course is obstructed by rapids. All the villages beyond Moina Mpafu's (where Captain Bia established a "garrison" of three men) are defended by stockades, and this defence is adopted quite as much against the Arabs and Kasongo of Urua, as against neighbours who ought to be friends. A pastoral plateau (4050 feet), abounding in numerous-wooded ravines and stockaded villages, separates the Luembe from the Lomami (3480 feet), which was crossed in boats on December 21st. A low and swampy forest (3720 feet) separates the basins of the Lomami and Lovoi, a tributary of the Western Lualaba. It was at Kahamai, just before reaching the Lovoi, that Captain Bia crossed Cameron's track. The country to the eastward, as far as the Lualaba, is described as a wooded savannah; the villages are stockaded and hidden among trees. The natives are armed with bows, poisoned arrows and javelins, and are in the habit of way-laying caravans. Progress was rendered difficult owing to heavy rains, which flooded the whole of the country.

On January 2nd, 1892, Captain Bia reached Lake Kabele (3740 feet), a backwater of the Lualaba, with which it communicates by four channels which alternately fill and drain it. It is about 8 miles across, and fringed with a papyrus swamp. The Lualaba was reached at Mushimuna (January 19th), but Captain Bia crossed it higher up at Kisambo, where it is about 500 yards wide, with a feeble current and quite navigable up to the Bundwe Falls.* Having crossed the Lualaba, Captain Bia went through grass-land to Kibanda (Chivanda) on the Fungwe, and visited the hot spring in the neighbourhood. He then

* Unless there is some gross mistake either in Lieutenant Le Marinel's or Lieutenant Derscheid's latitudes, the latter of whom places Kizinga on Lake Kabele in lat. $8^{\circ} 52' S.$, whilst Lieutenant Le Marinel tells us that he crossed the river in lat. $9^{\circ} 12' S.$, both expeditions must have crossed the Lualaba in the same locality.

crossed over lofty hills, where bamboo forests occupy an extensive area, and ultimately came out upon the plain of Manika, near the Lufira. On January, 1892, he was at Bunkeya.

Dr. Cornet states that the whole of the region traversed, with the exception presently to be stated, is occupied by horizontally-bedded crystalline schists and primary rocks (Devonian, Carboniferous and Permian). Between the Lovoi and the Manika plain the strata are tilted up, and concealed by a superficial deposit of recent age. Eruptive rocks of great variety abound in this disturbed region, and argentiferous ore was discovered.

In June last Captain Bis appears to have started for Lake Bangweolo.

DR. BAUMANN BETWEEN VICTORIA NYANZA AND TANGANYIKA.

Dr. O. BAUMANN has accomplished a journey which throws considerable light upon the country between lakes Victoria and Tanganyika. Leaving Bukombi, on Smith's Sound, in the beginning of August, he travelled through Uzinja to the Emin Pasha Gulf. He left the Victoria Nyanza at Bukome ($2^{\circ} 48' S.$) where Mr. Stokes has a station, and travelled westward through an uninhabited country until he reached Eastern Usui, whose chief, Kasasura, willingly supplied him with provisions, although declining to receive the traveller. Mr. Stokes and several Arabs have stores at the chief's capital. The ivory trade is important, and there is no trade in slaves. The country is intersected by numerous cliff-bound valleys, separated by broad, rolling plateaus, fairly well cultivated. Sorghum, manioc, sweet potatoes, and bananas are grown. The drainage is towards the Urigi Lake. Western Usui, or Uyagoma, is a stony land without perennial rivulets, and water is procured from wells. The inhabitants are Wazinja much mixed with Warundi, and the language of the latter is spoken. The chiefs are Wahuma. On August 28th Dr. Baumann crossed Mr. Stanley's route, and on the following day arrived at the poor village of Yarigimba, the chief of the country. Four days afterwards he reached the Kagera or Ruvuvu River, which separates Usui from Urundi; it was crossed in boats. The Warundi received their visitor with much rejoicing, for they conceived him to be a descendant of their king, Mwezi, who had been killed in battle about a generation ago,* and had gone to the moon ("Mwezi"). Northern Urundi is a country of grass-clad mountains, on the slopes of which are built the villages hidden among groves of bananas and of trees with shining leaves, which supply bark

* Mwezi ("Moon") is mentioned by Burton (*Journal*, R.G.S., 1859, p. 278).

for making cloth. The narrow valleys are full of running water, often choked with papyrus swamps. The population is dense. Provisions (pulse, bananas, and cattle) are plentiful, and there are neither beggars nor thieves. The pastoral Watusi (Wahimi) occupy a great part of the country, and domineer over the Warundi. There is also a pariah tribe, the Watwa, who hunt and make earthenware. After a journey of four days through this country, Dr. Baumann, on September 11th, crossed the Akenyaru, also called Nyanza ya Akenyaru, although not a lake, as supposed by Mr. Stanley, but a navigable river, which broadens out occasionally into papyrus swamps. The Nyavarongo (Mworongo of Mr. Stanley) is a tributary of it. The Akenyaru separates Urundi from Ruanda. The character of the country remains the same, but the villages are cleaner and the agricultural products more varied. The people are kinsmen of the Warundi, and, like them, are under the Government of Watusi. Dr. Baumann was invited to pay his respects to King Kigere, who resides at Kizege, a few days to the south-east of the Mfumbiro, but he declined to do so. After four days' march in a westerly direction he once more crossed the Akenyaru, about one day's journey from its source, and re-entered Urundi. The mountains grew loftier, and numerous rivulets take their course through



steep valleys in the direction of the Ruvuvu or Kagera. The Warundi were as enthusiastic as before, and their worship extended even to the white donkey of the man whom they supposed had returned from the moon. The Watusi, however, proved hostile, but their attacks on this and subsequent occasions were easily beaten back. Following a wooded mountain range, known as Misozi a Mwezi, or "Mountains of the Moon," which forms the watershed between the Nile and the Rufizi, Dr. Baumann, on September 19th, arrived at the source of the Kagera, which he is inclined to look upon as the true source of the Nile. The Warundi hold this locality sacred. In an ancient wood close by they used to celebrate the funeral rites of the Mwezi, whom they buried upon the summit of the Ganzu Kulu, which rises above the "Mountains of the Moon."

Dr. Baumann rested here one day, and then followed the dividing

range to the south, crossing numerous spurs. On the following day he crossed the watershed at an elevation of 10,000 feet, and reached the fertile district of Imbo, where he saw the broad plain of the Rufizi lying beneath him. Villages were numerous. The oil-palm and grey parrots were again seen, and many of the natives were dressed in cotton, those of northern Urundi and Ruanda having contented themselves with skins and bark-cloth. On September 25th, the traveller reached one of the stations of Rumaliza, in Uzige, at the northern end of Tanganyika. The Warundi in this district, fish, till the soil, and export palm-oil, but the Arabs principally deal in slaves.

Dr. Baumann then travelled in a south-easterly direction to Tabora, where he arrived on November 7th. Having climbed the steep mountains which shut in the lake on the east, he came upon a fine pastoral region, sloping to the eastward, and occupied by warlike Watusi. Here he crossed the Mvarazi and the Luviroza, tributaries of the Ruvuvu and consequently the most southerly head-streams of the Nile basin. Stony ranges of mountains form the watershed between the Ruvuvu and the Mlagarazi. The last village of the Warundi, built on the branches of trees, stands on the latter. Uhha, which lies beyond, has open forests of great extent in which grow acacias and a tree resembling our beech. The inhabitants are kinsmen of the Warundi. They are governed by petty chiefs and live in small villages. All their cattle were stolen a few years ago by the Masai. Crossing the Mlagarazi once more and passing through Muhambwa and Mulunga, both districts of Uhha, Dr. Baumann arrived in Kirambo, which is inhabited by Wasumbwa, a division of the Wanyamwezi. He then crossed the Igombe River, passed through Urambo, now ruled over by Tugamoto, a son of the famous Mirambo, visited Mr. and Mrs. Shaw at Kilimani Urambo, and ultimately reached Tabora. During the whole of this expedition Dr. Baumann only lost five men, one of whom was killed by the Watusi. On the other hand there were "numerous" births among the wives of the elephant hunters who accompanied him.

THE PERMANENCE OF OCEAN BASINS.

By HUGH ROBERT MILL, D.Sc., F.R.S.E.

AN interesting discussion has recently taken place in the pages of *Natural Science* upon the question of the relative permanence of oceanic and continental areas. Dr. A. Russel Wallace comments on the remarkable convergence of independent lines of research which led Professor Dana, Mr. Darwin, Sir Archibald Geikie, Dr. John Murray, the Rev. O. Fisher, and himself to the same conclusion, that continents and oceans have not changed places in geological times. He adduces

three new arguments in favour of these views:—(1) The enormous disproportion between the mean height of the land and the mean depth of the ocean, which would render it very difficult for new land to reach the surface till long after the total submergence of the sinking continent; (2) the wonderful uniformity of level over by far the greater part of the ocean floor, which indicates that it is not subject to the same disturbing agencies which throughout all geological time have been creating irregularities in the land surface—irregularities which would be far greater than they are were they not continually counteracted by the lowering and equalising effects of subaerial denudation; (3) the remarkable parallelism and completeness of the series of geological formations in all the best-known continents and larger continental islands, indicating that none of them has risen from the ocean floor during any era of known geological history—a conclusion enforced by the absence from any of them of that general deposit of oceanic ooze at some definite horizon, which would be at once the result and proof of any such tremendous episode in their past history.

Mr. Jukes-Browne combats the theory of the permanence of original oceanic and continental areas by pointing out that, as a matter of fact, deposits which must have been formed in very deep water have been detected in elevated land. He denies the force of the second argument quoted above on account of our comparative ignorance of the details of sub-oceanic geography, and because long-continued sedimentation must have tended to reduce the irregularities of the ocean floor, which would in any case be less than those of the continents, and, finally, because Mr. Fisher's theory of the sub-oceanic outpouring of lava might account for the uniformity of the ocean-bed. Mr. Jukes-Browne also shows how it is possible that the volume of the ocean was formerly very much less than it is now, and that in consequence of the release of water from chemical union with hot rock-material by volcanic explosions the volume has been steadily increasing. Hence, in palæozoic times, he argues that the land area may actually have been in excess of the water area, and the continental plateaux might have been much less elevated above the ocean floor than they are now—that, in fact, the elevations and depressions might not have been of the character of continent and ocean-basin at all.

Mr. Jukes-Browne's remark as to long-continued sedimentation obliterating the irregularities of the ocean floor requires proof. Dr. Murray has shown that the shallower the sea is the more rapidly does sedimentation far from land proceed, sedimentation tending to exaggerate and not to obliterate, initial differences of level.

Dr. W. T. Blanford, whose name had been mentioned in the articles as an opponent of the theory of the permanence of oceans and continents, explained that he objected to strong statements on either side, and urged great caution in forming opinions from such incomplete data as we

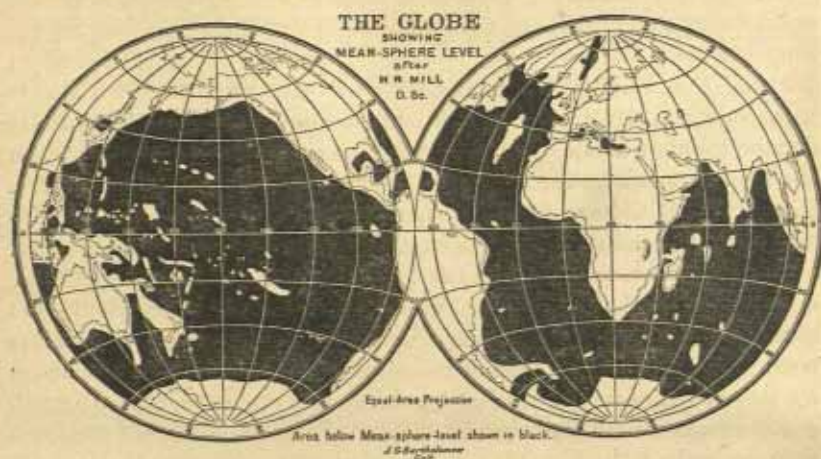
possess. He objected, as did Mr. Jukes-Browne, to assuming that no part of the sea-bed at a depth exceeding 1000 fathoms has ever been dry land; but Dr. Wallace explained that he took the 1000-fathom line as only an approximate boundary, and even in the first edition of 'Island Life' admitted certain exceptions. Hence his advance to 1500 or even 2000 fathoms in some cases did not affect the consistency of his views.

Professor James Geikie in his address to Section E of the British Association last year (*Proceedings* for 1892, p. 638), touched upon the interchange of elevation on the continental margin, and Dr. Blanford quotes his statement as one fairly representative of modern views on the subject. He says, "The continental plateau and the oceanic hollows have never changed places, although from time to time portions of the latter have been ridged up and added to the margins of the former, while ever and anon marginal portions of the plateau have sunk down to very considerable depths." In a paper on the "Evolution of Climate," published in the *Scottish Geographical Magazine*, vol. 6 (1890), p. 57, Professor Geikie gives a series of maps showing the approximate distribution of land and water at different geological periods, a re-statement with new data of Dana's earlier work. He understands the evolution of continents to be a transition from insular groups of land to a solid continental form, the island groups appearing upon the gradually emerging continental plateau. The diversity in opinion of students of this department of physical geography seems to be due rather to individual differences of confidence in drawing conclusions, than to any serious conflict of belief as to the bearing of ascertained facts.

The actual dividing line to be assumed between the oceanic and continental areas is obviously to a large extent arbitrary. The great ocean basins are comparatively flat-floored, the continental areas bounded by the 100-fathom line are, in a general way, roof-shaped, partly flat, partly composed of steep irregular slopes. Between these two great and definite regions there is everywhere a wall or zone of transition equally definite, forming a relatively abrupt descent. Along the slope of the entire development of this zone the difference of vertical height for a given horizontal displacement at right angles to the contour lines is greater than in any other part of the Earth, a few mountain ranges excepted. The line separating the two areas must lie somewhere on this slope. The 2000-fathom line lies near the bottom of the slope close to the ocean floor, the 1000-fathom line lies nearer the top than the middle of the transition zone.

Calculating from Dr. Murray's data, I showed in 1890 (*Proceedings*, Roy. Soc. Edin., vol. 17 (1890), p. 185), that the contour line of 1700 fathoms divided the surface of the Earth almost exactly into two equal parts, one a nearly continuous area of elevation, the other an equally continuous area of depression. This line I termed mean-sphere level, because it had the remarkable property of repre-

senting the intersection of a geoidal shell, the depression of the crust below which was equal in volume to the protuberance of the continents above it. The exact position of the line of mean-sphere level it is, of course, impossible to determine until the volumes of oceans and continents below and above sea-level have been accurately ascertained, and until sea-level is itself corrected for gravitational distortion, but the position cannot be very far removed from that assigned to it. The accompanying sketch-map on Lambert's equal-area projection serves to show graphically the two great areas of elevation and depression separated by the line of mean-sphere level. The area of depression may be termed the abysmal area, a name which Dr. Murray originally applied to the region lying at a depth greater than 1000 fathoms; the elevated half includes the dry land or continental area proper, and the transitional area or flanks of the continental plateau, at present covered with water. If any compressive stress were limited to one-half of the



area of the Earth's surface while the crust was plastic and undistorted, the surface being everywhere at mean-sphere level, a mass would be elevated over the free half to such a height as would, by its weight, balance the force of the pressure causing the depression, and if the density of the crust were uniform the depressed and elevated volumes would be the same. It seems probable that the series of changes which have evolved continents and oceanic hollows may be related to the line of mean-sphere level, the position of which corresponds with that which Dr. Wallace has been led to adopt as his boundary between oceanic and continental areas. By the adoption of this physical constant some of the objections to the theory of permanence are overcome, especially that which charges those to whom the evidence seems more complete than it does to others with a change of ground when they slightly modify an approximate and largely arbitrary limit.

The main fact, conceded by all who have studied the subject, is, that there is such a thing as the evolution of continents, the heights and hollows of the Earth's crust having become greater with the lapse of time. And all, also, concede that the present ocean basins represent regions where subsidence has predominated over elevation, while the continental area is that in which elevation has been more active than depression. Thus the actual level of the sea is an accident depending on the volume of its water and the inequalities of the crust, equal variations in which, on the hypothesis of constant volume in the ocean, may have led to very different emergence or submergence of the border areas according to the angle of the slope. At present the coast-line lies nearly mid-way on the flattest expanse of the continental margin, so that a given increase or decrease in the volume of the ocean would cover or lay bare the largest possible area of land.

THE RECLAMATION OF THE ZUIDERZEE.

By Professor P. H. SCHOUTE, of Groningen.

THE question of the reclamation of land now covered by the Zuiderzee is no new one, but it is only recently that a thoroughly practicable scheme has been matured for the accomplishment of this great engineering feat. In 1886 a Committee was appointed to consider and report upon the question under the chairmanship of Mr. A. Buma, who had frequently urged this matter upon the attention of the Government. The result of the deliberations of this Committee has been published in the form of eight memoirs, in which the whole question is thoroughly discussed in all its bearings. The first memoir deals with general principles, discussing the best position and direction for the main dyke which shall shut off communication with the sea, and sketching a general plan of the engineering works to be effected. The commercial and strategical aspects of the proposed changes are also fully considered. The three succeeding memoirs are more technical in their treatment of the engineering problems. The means of protection against floods and the maintenance of navigable channels after the seclusion of the sea are entered into in some detail. In the fifth the best form of construction for the main dyke, with its sluices and other works, is minutely discussed, and the whole question of land reclamation by different methods is gone into. The sixth memoir is confined to a delineation of the present condition of the Zuiderzee, its depth, salinity, and the volume and velocity of the rivers which enter it. The seventh memoir has to do with the geological aspects of the scheme, discussing the nature of the sea-bed; and in the last the new plans are compared with former proposals for the same purpose.

As the subject is one of considerable geographical importance, on

Geogr. Journal 1892



Railways
Canals
Tramway
Roads

Vlieland

Texel

THE HELDER
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HARLINGEN

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18

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Surface

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19



Present Land Surface

Areas to be reclaimed

Character of Land at present submerged

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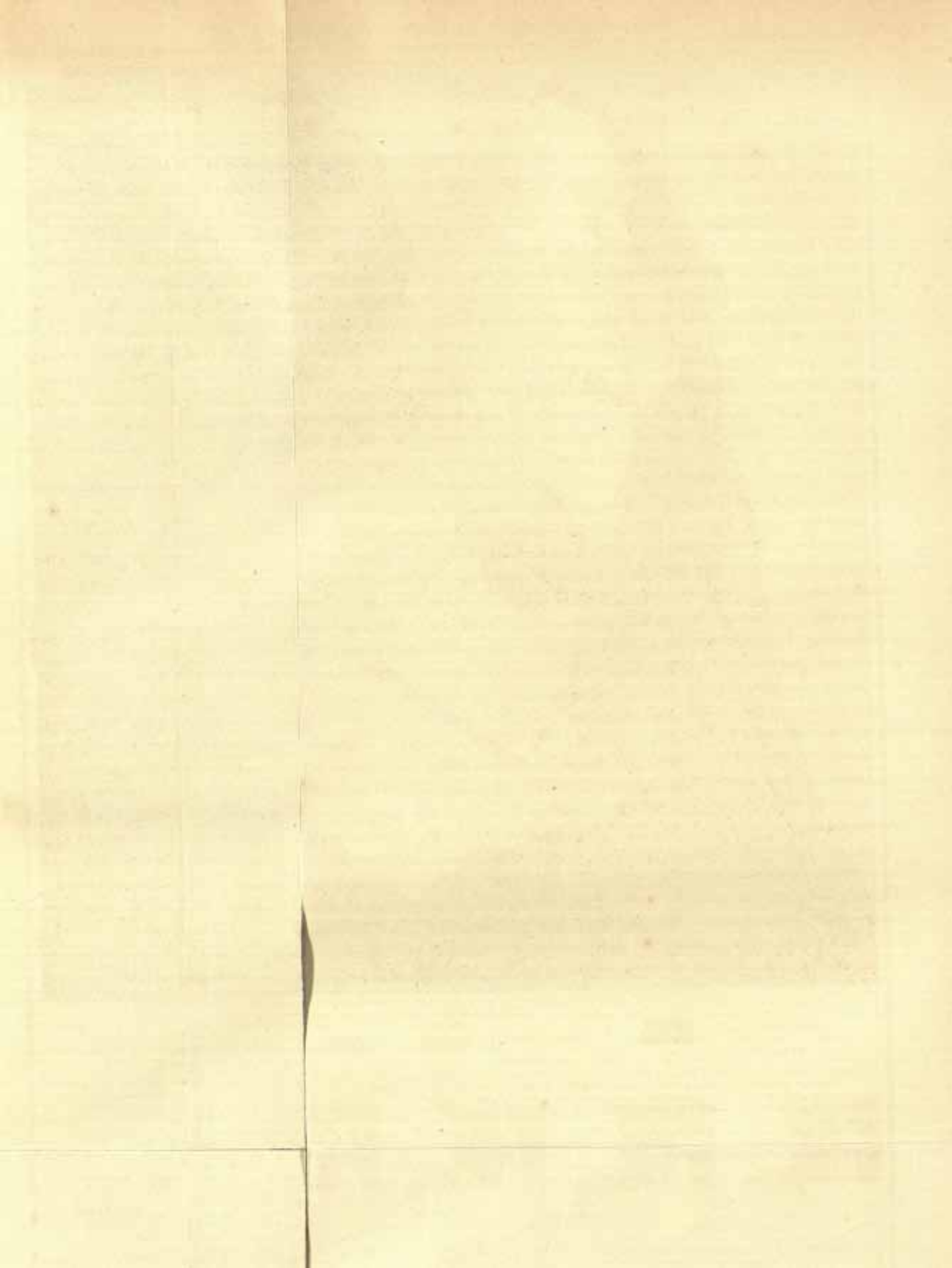
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 Turf Particle Clay
Limits of associated Polders

As at Present

As Completed





account of the magnitude of the proposed works, I shall endeavour to summarise the leading facts embodied in the voluminous report just referred to.

The proposal is not merely to run a dam across the mouth of the Zuiderzee and reclaim the whole of the enclosed area, but rather to reclaim certain large tracts along the margin of the enclosed part of the sea, leaving in the centre a tract of fresh water, the Ysel Lake, from which wide navigable channels will radiate to the important towns. The plan of reclaiming part of the area without secluding the sea was examined and rejected. The general plan of the proposed works may be seen from the accompanying map, and the proposed process of gradual reclamation is shown in the series of small maps beneath it. The general geological features of the sea-bed are shown on the larger map, where it will be observed that the fertile clay regions of the present sea-bed are marked out for reclamation, while the uncultivable stretches of sand are left as the bottom of the future Ysel Lake.

While the main interest of the proposed works is concentrated on the reclamation of the sea-bed within the great dyke, the plans contemplate the linking together of the islands of Texel and Vlieland, and doubling the area of the new island thus formed by reclaiming on the eastern side. It is also proposed to unite the West Frisian islands—Terschelling, Ameland, Schiermonnikoog, and others—to each other and reclaim the shallow sea inlets which separate them from the Friesland and Groningen shore, thus greatly reducing the length of the coast-line and greatly increasing the area of the country.

The main dyke is to run from the mainland of North Holland, through the island of Wieringen on the west to the village of Piaam in Friesland on the east. This dyke (including the island) will have a length of 18 miles, and it is by no means an unimportant matter that the protection of these 18 miles will relieve from the necessity of protection the whole 165 miles of Zuiderzee coast-line, which has at present to be watched and strengthened. A very important function of the great secluding dyke is to reduce the range of the rise of water with storms. No corresponding serious increase in the storm-level of the water outside the great dyke is likely to result, and it is considered that the danger of a serious flood in the case of the bursting of the right bank of the Prussian Upper Rhine would not be perceptibly increased.

With respect to the important question of the outflow of land water very careful observations have been made. It is found that the amount of water to be dealt with from the outflow of the Ysel, the other streams, the surrounding polders and the Zuiderzee itself stand in the proportions of 174, 111, 45, 36. It has been calculated that sluices with a depth of 13 feet, and a combined width of 1000 feet will amply suffice for evacuation sufficient to maintain the level of the projected Ysel Lake at the desired point. The evacuation of the existing polders

will be improved by the works, and their irrigation in the case of exceptionally dry summers will be very much facilitated, as the new Ysel Lake, unlike the present Zuiderzee, will be filled with fresh water.

The new scheme provides for the maintenance of all the important navigational features of the Zuiderzee. The actual navigation both by sail and steam is very great. Amsterdam, which supplies most of the trade, is yearly visited from the Zuiderzee by forty-six thousand sailing ships of nearly one million tons capacity, and by over eight thousand steamers, of an aggregate of 320,000 tons. When the great dyke is completed, water-communication between the outer sea and the Ysel Lake will be kept up by two canals. The first of these will lead from the open sea at Harlingen along the Frisian sea-dyke and through the east end of the Great Dyke to the Ysel Lake. The second canal will lead from the sea to the Ysel Lake across the island of Wieringen, and, as the lake will be kept in navigable connection with the principal trade towns now open to the Zuiderzee, sea-borne traffic will remain very much in its present state. The fisheries will, however, naturally suffer by the change from salt to fresh water.

The proposed seclusion dyke would require at least eight years for completion, the four inner dykes, and the polders they would enclose, twenty-four years more; and it would be undesirable for several reasons to occupy less time. The expense of the great seclusion dyke is estimated at about £3,500,000, and the four great reclamation works in the interior will cost about £12,300,000 more, a total cost of about £16,000,000. Against this must be set off the value of a little more than 530,000 acres of reclaimed land, of which nearly 500,000 acres may be expected to prove fertile. It is considered inexpedient to bring more than 25,000 acres of new land into the market each year; and of the estimated cost of £33 per acre, it would be fair to expect assistance from Government to the extent of a fourth part in respect of the improved condition of the kingdom with regard to danger from the sea. A fair rent for the reclaimed land may fairly be expected, probably £2 per acre, yielding annually an interest of over £1,000,000, when the reclamation is complete. The immense amount of employment for engineers and labourers, who at present have not sufficient occupation, must of itself be a national benefit.

Professor Telders of Delft gives, as his opinion of the scheme, that it is very difficult, but quite possible with Government aid. He considers that the construction of the secluding dyke will be more than repaid by the consequent cheapening in the reclamation of the Zuiderzee coast-lands, their ready evacuation or irrigation, and the establishment of direct railway communication between North Holland and Friesland. The outlay for roads, and possibly also for national defence, will be increased, but not out of proportion to the benefit secured.

Recently (September 8th, 1892) the Dutch Government has appointed a new Committee to report upon the scheme worked out by the Committee of 1886 (*Zuiderzee-vereeniging*). Of this new Committee, the Minister of Trade, Mr. C. Lely, is president.

MAP OF THE WORLD, 1542.*

THE original of this map is in the Royal Library of Stockholm, and is described in an accompanying pamphlet, by E. W. Dahlgren, as being drawn on three sheets of parchment, which together measure 1440×790 millimetres. The present reproduction is a facsimile in everything except the colouring, the ornamental border, and the inscription. As regards the general appearance and arrangement of the map, a reduced copy, which is also furnished, can be consulted. It will there be seen that the globe has been projected on the plane of the Equator, and divided into thirty-six gores, each of which measures 10° of longitude; but from the ornamental border and inscription, it is evident that it was not the intention of the author that it should be cut up and used as a covering for a globe. A scroll which runs the whole length of the map bears the following inscription:—

"Nova verior et integra totius orbis discripto nunc primum in lucem edita per Alfonsum de Sancta Cruz Caesaris Charoli V. archicosemographum. A.D. MDXLII."

In the lower left-hand corner there is a dedication to the Emperor, surrounded by an ornamental border. As Santa Cruz participated in Sebastian Cabot's unsuccessful expedition of 1526, the object of which was to take the same course as Magellan, but which did not extend farther than the Rio de la Plata, it would naturally be expected that in that part of South America the most important information would be found. The results of this voyage had however already appeared on Ribero's two maps of 1529, and in this respect Santa Cruz's map has nothing of additional importance to present. It may however be remarked that we here for the first time find the name Rio de la Plata, and that the name Buenos Aires, which also occurs here for the first time, shows a knowledge of Pedro de Mendoza's expedition of 1535, when that city was founded.

The coast of Africa is evidently drawn from the charts of the beginning of the sixteenth century, such as the Cantino map of 1502. The mapping of the British Isles, Western Europe, and the Mediterranean exhibit, in a form modified to suit the projection, the coast-

* Map of the World, by the Spanish cosmographer, Alonzo di Santa Cruz, 1542. Reproduction in phototypic facsimile, by the printing office of the Swedish Staff-General, with explanations by E. W. Dahlgren, Stockholm, 1892.

line as shown in the Portolanos. The coasts of Arabia, Persia and India, are, with some slight changes, identical with those of Ribero. The farthest east, shown on the map, is *Isla de Santa Cruz*, an island a little to the east of Canton. The mapping of the East India Archipelago is very much the same as that of Ribero's maps of 1529, except that the south coast of Java and the east coast of Gilolo are shown.

The interiors of the continents contain but few names, and are for the most part occupied by quaint drawings of men, camels, elephants, ostriches, crocodiles, basilisks, etc. Of the rulers of different countries, so common in the maps of the sixteenth century, there is only one given, and that is a figure representing Prester John of Ethiopia, under which the following inscription is written: "*A qui abita el preste Juan de las indias tienen tres bautismos de agua y fuego y sangre guardan la doctrina de S. Matheo.*" Every fifth meridian and every tenth parallel is drawn, and the degrees of longitude are reckoned both east and west from a prime meridian which runs a little west of the island of Fayal, and in the eastern hemisphere passes through Java and Annam, thus showing Asia as extending by about 40° of longitude too far to the east. On long. 20° W. the papal line of demarcation (*Meridianus Particionus*) is shown. It crosses America at the mouth of the Amazons, but assigns all the land east of the mouth of the Ganges to Spain, which is distinguished from that assigned to Portugal by the flags of each nation drawn on the southern hemisphere on either side of the line of demarcation.

In the accompanying letterpress a detailed description of the map is given, and a list of names that appear on it; these are printed in red or black according to the colours in which they appear in the original map. The work of reproduction, so far as it goes, has been carried out in a most satisfactory manner by the officers of the Swedish General Staff. It would, however, have been more satisfactory if the colouring of the original map had appeared, as it would then have been in all respects a facsimile.

A NEW MAP OF SWITZERLAND.*

THE task of the map-compiler, with regard to the physical features of the Central Alps, has been greatly lightened of late years. Specimens of the old Alpine maps engraved prior to, or without reference to, the Dufour Atlas or 1:100,000 Swiss map, are still extant in so-called modern atlases. But most cartographers have known how to avail themselves more or less of this material. Their difficulty has been with the southern slope, where the old Piedmontese and Lombard Surveys were very inaccurate. The late Mr. Nichols did his best to bring together the valuable

* Stanford's New London Atlas Map of Switzerland, scale 8 miles to 1 inch. London: E. Stanford.

work of Mr. Adams Reilly and other Alpine explorers in the beautifully-engraved Alpine Club map, published in four sheets by E. Stanford in 1874. The map, on a scale of 8 miles to an inch, now issued by the same firm has the advantage of dealing with a region, the recent government survey of which has, except in a few localities, been completed. The problem has been not so much to gather together trustworthy material as to reproduce on a comparatively small scale the material in hand in such a way as to give at once an accurate and intelligible bird's-eye view of the chief features of the Alps—their ridges and valleys, their snows and lakes. For the first time, in a map intended for a general atlas, the glacier region is clearly defined, and its comparative extent in different districts made visible at a glance.

The map has been drawn with the greatest care and nicety from the latest Swiss, French and Italian surveys, and the Alpine Club Map, on a scale of 4 miles to an inch, and then reduced by photography to half that scale, the artist-draughtsman's work being reproduced by sun-engraving with absolute fidelity. The result is very clear and intelligible, and, except that the relative steepness of the snows is not indicated, the sheet gives a very accurate idea of the general topography of the region depicted. In the special copies, a hundred of which only have been printed, no names have been inserted. Roads and railways, as laid down, have been carefully brought up to date, though in one or two instances slight omissions occur, *e.g.* the roads in Val Masino, and up the gorge known as the Via Mala Bergamasca in the lower Val Schilpario. The production of maps by sun-engraving, though largely and successfully practised in Austria and in other countries of Europe is, as regards Great Britain, an innovation, and it is to be hoped that the very satisfactory results obtained in the present instance may encourage map-producers in this country to make use of this process which has the advantage of giving an exact reproduction of the actual work of the skilled draughtsman, and therefore avoids all possibility of error after the work has passed from him into the hands of the engraver.

FLOODS IN QUEENSLAND.

By HENRY O. FORBES.

THE telegraph has brought us during the past month distressing accounts of floods of a very disastrous character in the southern portion of Queensland. The districts which have suffered most severely are those lying near where the Brisbane, the Burnet, and the Fitzroy rivers fall into the Pacific, namely, the Brisbane in Moreton Bay, the Burnet in Hervey Bay, and the Fitzroy in Keppel Bay, along a coast-line of 420 miles. The details of the calamity that have reached this country refer chiefly to the districts in the

neighbourhood of the capital, Brisbane, where the floods seem to have been exceptionally disastrous. The city is situated in a deep bend of the river of the same name, 25 miles from its mouth, chiefly on its northern bank, but with an important suburb on the southern side. South Brisbane is connected with the city, as is stated in Wallace's 'Australasia,' by a "noble iron bridge more than 1000 feet long with two swing openings of 60½ feet wide each to allow the passage of ships," a statement which, though true up to the beginning of February is unfortunately no longer so. It is situated on much lower ground than the main part on the opposite bank, and it is naturally, therefore, the portion of the city in which the destruction of property and life has been greatest. In the west-end of South Brisbane we learn that only some twenty-five houses are left standing out of five hundred, and these were covered several feet deep in water, while between thirty and forty persons have been drowned. Those who had lost their homes were compelled to live in tented boats. The northern portion of the city is laid out in terraces rising to several hundred feet above the river, and consequently none of the important public buildings and chief residences would be imperilled. The streets by the narrow river-flat at the bottom of the rise have, however, suffered severely. The Botanical Gardens extend from the river-side on a steep slope up to the grounds of Government House, and it must, therefore, be their lower portions only that have been destroyed. They are situated at the western corner of the bend, and the river evidently taking a short cut over, has swept the flats in the centre of the city to the north-west of the Gardens, and the lower terraces of the Gardens themselves, carrying with it the two steamers—probably small river steamers, many of which have their anchorages a little farther round the bend—which have been stranded amid its trees. The chief loss the city has sustained is undoubtedly the destruction of the fine bridge already referred to uniting the two parts of Brisbane, which was erected at a great cost, and took nine years to build. It is reported that property to the value of £2,000,000 sterling has been destroyed in the town and suburbs; but, it is to be hoped that this may prove to be an over-estimate. This is not the first, though it appears to have been the most serious inundation that has befallen Brisbane, and the region now again affected. Only a few years ago the capital and many of the coast towns and districts were flooded, much property destroyed, and several lives lost.

The greatest amount of rain falls in Queensland during the summer months from December to February, and chiefly on the mountain ranges running north and south parallel to the east coast at distances varying from 20 to 100 miles. These ascend rather abruptly to broad plateaus of from 1500 to 4000 or 5000 feet above the sea. The rivers along whose lower reaches the floods have, according to our latest

information, been most destructive collect their waters over 8° of latitude, commencing in the north where the range runs out on to the coast, and extending south to the New South Wales boundary. Whether the Darling River, whose tributaries drain the western slopes of these ranges into the Murray and the Indian Ocean, and the Bardekin River,—whose southern affluent (with its branches), gathering its supplies from the western aspect of the same coast range, falls into the Pacific after running north through 5° of latitude,—participated in these floods we have as yet no intelligence. The Brisbane has much the shortest course of the rivers that drain this triangular area; but it has a steep gradient, and a very tortuous course, especially in the vicinity of the city, which by preventing a sufficiently rapid outflow into the bay, accounts for its great rise and destructive effects.

Some accounts state that the floods have spread “to the west of Brisbane, *vid* Ipswich, as far as Toowoomba, the main town of the great agricultural district of Darling Downs.” Ipswich, the second town of importance in the colony, is situated on the lowlands, and is a seaport at the head of the navigable water of the Brewer (a southern tributary of the Brisbane) River, 25 miles west of the capital, and may have suffered to some extent from the floods; but it is chiefly placed on hills rising considerably above the reach, we believe, of even very great inundations. But that Toowoomba, lying 100 miles west of Brisbane, could be reached by the floods from the lowlands is impossible, as it stands on the edge of the plateau of the Darling Downs, nearly 2000 feet above the sea. It is from Toowoomba that the western line from Mitchell, and the Great Southern Railway from Sydney and Adelaide, descend the abrupt escarpment facing the Brisbane plain, by a well-known zig-zag line. It is probable, however, that the heavy rains on the plateau may have caused damage to the town and that famous agricultural district, or to this railroad which in its descent crosses numerous ravines which no doubt were converted into raging torrents.

Past the town of Gympie, 116 miles north of Brisbane, runs the Mary River, which drains the northern slopes of the watershed of the Brisbane River, and flows north by Maryborough—on the alluvial flats 25 miles from the mouth of the river—into Great Sandy Strait. All along this river, therefore, as might be expected, great damage has been done to private and public buildings, while the gold mines round the former town—the richest and most important in South Queensland—have been filled with water, and will be unworkable for a long period. The Fitzroy, which passes Rockhampton and enters the sea in Keppel Bay, has tributaries along 380 miles of country from north to south and for nearly 200 miles to the west, where the western edge of the plateau recedes farthest from the sea; the amount of water, therefore, which it must collect from this area during sudden or long-continued rains must be enormous, and it is not surprising to learn that there has been great

devastation along its banks and in Rockhampton, which lies 40 miles from the sea. The southern coast hills have, as a rule, a less rainfall than the northern, and their eastern slopes receive more than their western. On the high coast plateau 30 to 70 inches per annum fall on the east side, while on the west side 15 to 30 inches only are registered. The southern parts of these ranges appear to be periodically subject to unusually heavy rains, and their rivers, either from their steep gradients or the enormous extent of their catchment basins, produce floods along these 400 miles of coast-line, and doubtless in some parts of Victoria, as the Condamine, one of the great tributaries of the Murray, rises in the Darling Downs. It will be evident by a glance at the map that the whole of the region which has recently been inundated in Queensland, as well as much of Victoria, might be affected by a sudden heavy or continued rainfall over a comparatively small region north-west of Brisbane, restricted to the eastern parts of the Darling Downs, and the southern part of the Burnet, and the eastern corner of its neighbour, the Leichardt country, as the Condamine and all the rivers discharging along these 420 miles of coast—from Rockhampton to Brisbane—rise in or receive important tributaries from this circumscribed area.

DISTRIBUTION AND MOVEMENT OF POPULATION IN INDIA.

THE results of the late census of India, with regard to the distribution and movement of population, were put before the Royal Statistical Society, in a paper read in December last by Mr. Baines, the Census Commissioner. These subjects being intimately connected with the varying physical features and climatic characteristics of different parts of the country, it is impossible to deal with the latter as a whole. Taking these two points into consideration, and omitting the mountain frontier, only a fringe of which is touched by the census, India may be broadly subdivided thus: Firstly, some plains, some drained by large rivers, with a certain rainfall; others (in the meeting zone of the two branches of the south-west monsoon) fertile, but with more uncertain seasons; and one (in the lower Panjab and Sindh) either desert, or dependent for crops on irrigation. Next, we have the tablelands of the Deccan, &c., still more liable to deficient rainfall, from their situation between two monsoon currents, and with, accordingly, less productive soil. Thirdly, the forest-clad hill tracts, between the latter and the plains, with fairly abundant rain, but of which no large proportion is arable land. Lastly, the coast-strips, mostly fertile, and in the extreme south, a tract with good soil, but capricious rainfall. The average density of population in India, 184 to the square mile, is not great, but there is great unevenness in its distribution. In British territory 45 per cent. of the population occupy only 16½ per cent. of the area with a density more than double the mean for the whole, which is 230. In two districts, in Eastern Bengal and along the Goghra, a maximum of 790 is reached; yet even here, owing to the great natural advantages, the pressure on the land is probably no greater than in other less fortunate tracts with a much smaller density; as, e.g., the east of the Deccan and parts of Madras, which, with a light soil and precarious rainfall, support only 122 to 150 per square mile. On the other hand, wide tracts are capable of supporting a much larger population than the present.

Thus, Assam, excluding the Surma Valley, has only 76 inhabitants to the square mile. In Madras, apart from the unlucky tract above mentioned, we find a more evenly distributed population, and an average (252) more nearly approaching the general one. In the Native States, as a whole, the figures are lower, and even where, as in Travancore and Cochin, they exceed four hundred, there is little complaint of congestion. The agricultural propensities of the population make the tendency to congregate in towns weak. Even the return of 9½ per cent. for town-dwellers is fallacious, owing to the inclusion of small market centres, while towns of twenty thousand inhabitants and over contain only 4·8 per cent. of the population. As to the rate of increase of population in the decade, the mean of 11 per cent. cannot be called excessively high, considering the absence of retarding causes. For British territory the rate seems on the whole to diminish as the density increases. Of the different causes of variation statistics as to the ratio between births and deaths are still wanting. Against the prevalence of marriage we may set the mortality among child-mothers and their infants, while the population is never long-lived. The effect of famines is probably felt for some time afterwards, while that of epidemics is always present. Migration, except to Assam and Lower Burma, plays a very small part, and the returns are perhaps swelled in some cases by the interchange of wives between contiguous villages. Only 3½ per cent. of the population were born beyond the territory immediately adjoining that in which they lived. The greatest increases (as in Lower Burma and Sindh) have been due to agricultural expansion, but the slowness of movement to new country from any distance, is shown by the normal rate in the Central Provinces in spite of their great advantages. The towns which show most advance are the seaports, manufacturing towns, and military stations, while in British territory the old centres tend rather to fall back. On the whole the growth in material prosperity has kept pace with that of population.

THE REGULATION OF THE IRON GATES.

IN a report presented to the Fifth Congress of Inland Navigation at Paris (1892), M. Béla de Gonda, Professor in the École Polytechnique at Budapest, reviews the problem of opening the navigation of the Lower Danube, and gives an account of the various attempts made to solve it since the fourth Scythian and fifth Macedonian legions carried out the plans of Damas Apollodorus in the time of Trajan. The interruptions begin below the town of Bazias, where the Danube quits the Hungarian plain, and terminate at the Iron Gates about 80 miles further down. From Bazias the Danube follows an easterly course between the Lokva and Rama mountains for some 30 miles, crossing the strike of the crystalline schists composing them almost at right angles. At Kozla, it turns to the south-east, and thence to Svinicza crosses the beds of rock at an acute angle, which increases as the stream sweeps round again to a north-easterly course at Jucz. From Plavisevicza to Ogradina the river follows the longitudinal axis of a geological valley, and then again turns eastwards and south-eastwards at Orsova, near the frontier of Hungary and Rumania. Between Ogradina and the Iron Gates the river-bed is cut across the granites and schists of the mountains which join the Balkans and the Transylvanian Alps. The geology of the region, which the Report discusses in some detail, is somewhat complex, chiefly on account of the variety of deposits overlying the igneous rocks, some of them rich in copper and in coal; many of the sections, exposed by the action of the river are of extreme interest.

The Danube is for the most part navigated by vessels drawing not more than 6 feet, and the interruptions between Bazias and the Iron Gates are to be regarded as such only in so far as they interfere with vessels of that draught; there is no question of opening the upper part of the river to sea-going ships. The ordinary season for navigation extends from March 1st to November 30th, and the passage of the Iron Gates, at all times difficult and dangerous, is on an average of 40 years altogether impracticable for boats drawing even 5 feet during 117 out of the 275 days, sometimes on account of the extreme velocity of the rapids, but more frequently through insufficient depth of water over the shoals. Starting from Moldova 20 miles below Bazias, where the Romans worked extensive copper mines, and following the river downwards, we find first a rocky shoal about half a mile in length deflecting the main current to either side, and widening the bed of the river to about $1\frac{1}{2}$ mile. Below this shoal the Danube first enters the narrows; the rocks on the left bank come close down to the river, and in less than a mile the breadth is reduced to 440 yards, the isolated "stack" of Babakay standing as a tell-tale at the head of the funnel. The depth, which in the dry season is from 7 to 10 feet at Moldova, suddenly increases to 70 and even 120 feet, gradually shelving up till at Alibeg, 3 miles further down, it again decreases to 20 feet as the stream becomes wider. At Stenka, 7 miles below Moldova, the first really dangerous rapid occurs, the river narrowing to about 1000 yards; but there is always sufficient depth of water. The first station for "portage" is at Drenkova, 5 miles further on, and immediately above the point where the river turns to the south-east. Below the turning the mountains on the left bank again advance into the river-bed, while the Kozla shoal forms a barrier on the opposite side. The current is then driven against a rocky reef at Dojke, which reflects it almost at a right angle, and the mountains close in on both sides, reducing the channel to little over 400 yards. From this rapid, which is about $1\frac{1}{2}$ mile in length, a comparatively clear reach extends to the rapids of Izlasz and Tachtalia, about 23 miles from Moldova, which ranks second only to the Iron Gates. At Izlasz, after narrowing to some 400 yards, the bed again widens, is crossed first by a bar and then by two shoals named greater and smaller Tachtalia, and immediately below is again contracted by the precipitous chalk cliffs of Greben. The narrow channel is beset with dangers—from shallows in low water and whirlpools in flood.

Next follow 30 miles of wide placid river, too shallow in places and broken during low water by a rapid at Jucz. The Danube then enters the pass of Kasan, at the entrance to which are the famous caves of Punjikowa and Veterani. Except at Dubova, where the bed opens out considerably for about a mile, the river flows to Ogradina, a distance of 6 miles, between walls of rock seldom more than 250 yards apart. There is here, however, little obstruction, the great depth of the channel (100 to 180 feet) preventing a serious rapid.

Then again the river widens, and turning more southward flows past Cserna, the ancient Tierna, where the remains of the Hungarian army buried the Hungarian crown in 1849, past the island-settlement of Ada-Kaleh (Uj-Orsova) which, after being alternately fortified and demolished for two hundred years, was taken over by the Austro-Hungarian monarchy in 1878, with an undertaking to protect its Turkish population, past the frontier town of Vodinca, and finally, a mile further on, enters the Iron Gates. There the channel, shallow and rocky for nearly 4 miles, is barred by the Prigradu reef, a wall over 350 yards wide, emerging above the surface at low water, which runs near the left bank for over a mile, and then crosses diagonally to the right just above Sibb. This wall, with numerous smaller reefs, extending to some 2 miles in all, constitutes the Iron Gates proper, and forms a dangerous cataract throughout its entire length.

The principal obstacles therefore occur at Stenka, Kozla to Dojke, Izlasz and Tachtalia, Greben, Jucz, and the Iron Gates, and at each of these points either the channel must be deepened or the difficulty of mounting the rapids diminished, or both, if navigation is to continue without interruption during the season, or, indeed, free of danger at any time. The Roman engineers avoided only the Iron Gates, cutting a canal on the right bank of the Danube through the whole distance. For the other obstructions they trusted to haulage, and constructed a stupendous towing-path, the *Trajani Via*, parts of which still remain. After the decadence of the Empire, the banks of the Danube became the scene of constant struggles with the Turks, and the question of navigation lost its importance. When the Turks were finally driven out of Hungary and peace restored in the beginning of this century, the Hungarian Council again took the matter up, and in 1816 ordered a survey to be made, which was executed between 1823 and 1838, with much opposition from the Turkish authorities. In 1830, Count Széchenyi attempted actually to begin the work of clearing the river, but in face of the political and engineering difficulties on the right bank thought it best to improve the land communication by constructing a thoroughly good road on the left. The necessary funds having been voted by government Széchenyi commenced operations in 1834, and the road was completed in 1837. The problem of navigation, however, came again into prominence after the Crimean War, and several fresh surveys were made, but without any practical result, until the matter was taken up by the Berlin Congress in 1878. On July 8th and 13th of that year the Austro-Hungarian government concluded treaties with Servia by which the former undertook to open the Lower Danube, without pecuniary sacrifice on the part of the latter, who were to enjoy full privileges, in consideration of their affording all facilities for the execution of the work; the moneys expended to be recovered, in terms of a former treaty, by tonnage dues. After further delay, caused by financial difficulties, plans based on a final survey were submitted to the Austrian, Servian, and Rumanian governments in 1883, and a law authorising the undertaking was passed in 1888, the cost being fixed at nine million florins. Contracts were placed with a syndicate, and signed in May, 1890, and operations formerly inaugurated on September 18th, 1890.

The international work laid upon Hungary at the Berlin Congress closely follows in its main features that of the Roman engineers. Shallows are removed in part by deepening the channel, in part by the erection of dykes, and rapids are overcome not by canals with locks, but by smooth channels and ample towing power. Its completion may be looked for in the end of 1895.

THE INDUSTRIAL DEVELOPMENT OF NYASALAND.*

By JOHN BUCHANAN, C.M.G.

NYASALAND may be said to be situated between 17° S. and 9° of N. latitude, and 36° E. and 33° W. longitude. It is now reached by the Chindé mouth of the Zambesi. Until the discovery by Mr. Rankin of the Chindé as a navigable river, Nyasaland lay under the great disadvantage of not being accessible save through the territory of a foreign power. We proceed up the Zambesi till we meet the Shiré. Th's river is followed to the confluence of the Ruw, which, on

* Paper read at the meeting of the British Association at Edinburgh on August 8th, 1892. Revised and extended for *The Geographical Journal*.

the left bank of the Shiffé, forms the British frontier. We may continue to follow the Shiré, depth of water permitting, to Blantyre Port, 10 miles below the Murchison Cataracts, or we may proceed overland from the Ruo to Blantyre or Zomba, and downwards to Lake Nyasa. There is a passable waggon road from Katanga or Blantyre Port, on the Lower Shiré, to Matobe, on the Upper Shiré, that is from below to above the Murchison Rapids. At present, however, tsetse fly blocks the upper end of this road to cattle. A road is being constructed by Captain Schlater, R.E., of the British Central Africa Administration, from Chiromo to Lake Nyasa *via* Zomba, and it is by no means chimerical to expect that at least a steam tramway may be in working order on this road within the next five years; greater advances have in the past taken place in Nyasaland within shorter time. Travellers from London to Nyasaland may reach Zomba or Blantyre within seven weeks. Recently I have had letters within five weeks from the date of departure.

Nyasaland is composed of mountain, hill and valley, lake and river, from the ever-present ant-hill to the magnificent Milanje Range, 9000 feet above sea-level, and from the tiny rill trickling forth from secluded spots in the depth of the forest to Nyasa itself, with its 350 miles length of placid blue, peacefully reflecting the unclouded canopy of heaven, or lashing green-crested waves shorewards, thundering and breaking on the beach like the ocean itself. The physical aspect of this district may be said to be represented by a series of undulating plateaux, from 2000 to 4000 feet above sea-level, studded with hills and miniature mountains, clothed to the summit with bush and forest trees, or showing only bald rocks, among which grow euphorbia, and aloe, and tufts of wiry grass, the latter a living exponent of the parable of the sower—exuberant and green while the rain lasts, rapidly passing through a transition stage to sere and lifeless when the supply of moisture fails.

Central Africa has for so long been associated with the idea of barren, arid tracts of waste land that it must be a relief to know that while that description may be true of one or two spots, it is totally inapplicable to the land under consideration. This is a well-watered country. On the mountain sides each ravine has its stream or burn shaded by bracken and bramble.

A prominent feature in the physical aspect of Nyasaland, as in many other parts of Africa, is the grass land which occurs in patches, it may be of acres, or it may be many square miles in extent; these grass lands are known to the natives as "dambo" or "lilambo." They are, as a rule, void of all trees save a species of *Eugenia* and *Protea*, and rest, I believe, on an impervious subsoil. During the rainy season the surface soil acts like a sponge, absorbing water till thoroughly saturated, at which stage it becomes virtually a marsh, and the water gravitating to the lowest level forms the nucleus of a stream, or as the natives have it "nduluko." Streams thus formed are, in the cases of some of the larger of these "dambo," almost perennial, but in the majority of cases, drainage and evaporation together exhaust the supply, and the "dambo" in the dry season becomes the driest of the dry places. There are, in addition, on the plateaux depressions large and small, having a great depth of loose soil, acting as a reservoir into which considerable extent of surface and underground drainage gravitates, and forming a nucleus for a perennial stream. These depressions are known to the natives as "litimbi," and form a very important part in the economy of agricultural life. Resting as they usually do on a subsoil of rock or tenacious clay, they have become enormously fertile through the surface-wash of ages having been deposited in them. In certain of them, which I examined by cutting a deep drain, I found that a perpetual ooze existed on the hard subsoil beneath the loose surface soil, the result of this being

that during the dry season capillary attraction brings to the surface sufficient moisture, which enables the natives to cultivate early crops of maize, beans, pumpkins, etc., while in the rainy season they become veritable aloughs, covered with rank coarse vegetation, into which no man can with safety enter. The drawback to open draining these places is, as proved in my own case, a danger that the surface soil during a deluge of rain slips off the hard under-stratum and is carried away, especially so should the depression be on a slope. On the mountains themselves, for example Milanje and Zomba, at an elevation of 6000 feet above sea-level, we have these depressions, which, as in the case of Zomba during a very wet season, assume the appearance of a small lake. While, therefore, the perennial water supply of Nyasaland comes from mountains and hills, and the streams, in consequence, may be widely separate, we have, owing to these grass lands and depressions, a supplemental supply which very largely benefits the country far on into the dry season, and would be available for the making of dams were the occupancy of the country to demand it.

The rainfall in Nyasaland varies considerably. In the Shiré highlands the average is about 52 inches, while on the lake it may average 80 inches or more. During the last ten years, while so far as I know there has been no marked change in the fluvial aspect of the seasons, there has been a decided falling in Lake Nyasa, and a drying up of the Shiré River. At no time within the last sixteen years was the Shiré River so low as in 1891. The Shiré is dependent on Lake Nyasa for its permanent supply, but, what is also of importance is, not that a certain quantity of rain should fall annually, but that the duration of the rainy season should be prolonged.

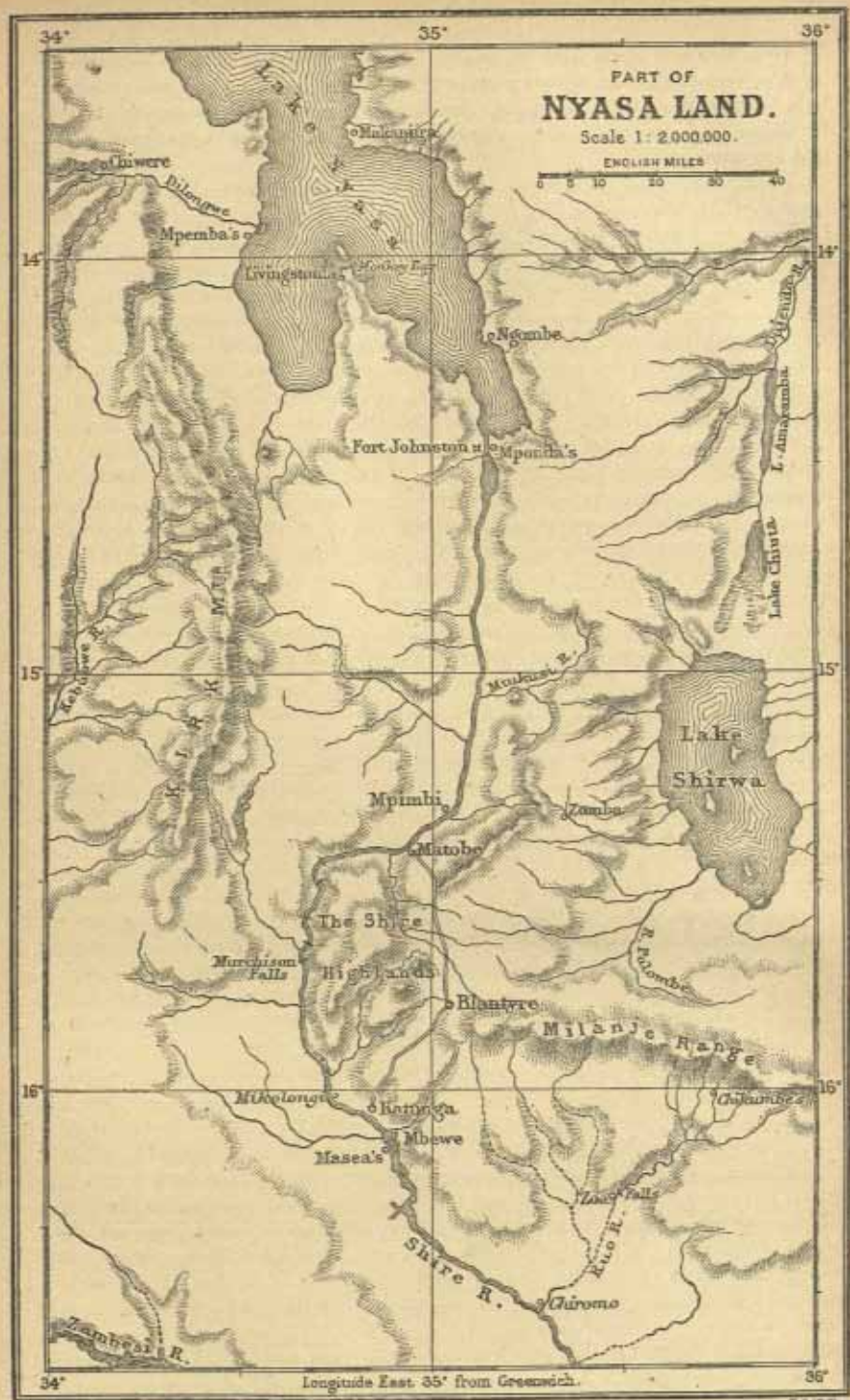
In 1879, Lake Shirwa was almost completely dried up. Yet notwithstanding, while last dry season was the most severe of any yet experienced by Europeans, there was more water in Lake Shirwa than in 1879. At the north end of Lake Nyasa, old natives will point to a ridge of sand ten or more feet in height above the present level of the lake, and tell you that they remember the water being at that point, while there is undisputed evidence from observations to show that the present average level of the lake is several feet below what it was ten or twelve years ago. Lake Shirwa, which may be looked upon as neither more nor less than a vast flat basin, has receded on the western shore at least a mile within the memory of lads under 25 years of age. Yet there has been no sensible diminution in the rainfall of the eastern Shiré Highlands to account for this. At the present moment, meteorological data are of the most meagre kind, but the comparison of a few years' observations, taken in many and varied positions will, I have no doubt, render the problem as to this desiccating influence soluble, and I am sanguine enough to believe that it will be found that the quantity of rainfall is not lessened, but that probably within certain cycles the duration of the rainy season is shortened, and evaporation in consequence does the rest. The cutting down of timber up to date, though bad enough, could have had no serious effect. May not another solution be the gradual rising of this part of the African continent?

The seasons may roughly be divided into four, corresponding to our spring, summer, autumn, and winter. In the end of September, and in the early part of October, notwithstanding the absence of rain, increased temperature causes vegetation to revive; trees and shrubs seem able from stores, elaborated during a period of rest, if rest there be, to start forth and carry on almost into full leaf. It is a trying time alike for plants and planter. When only bush and forest are at stake, and Nature can take her own time to repair the damage, the loss may be small; but it is different when fields of coffee are at stake. The best planting months are November and December, and the best growing months December, January, February and March.

In April, May and June, crops are reaped. June, July and August are the coldest months, when vegetation is outwardly, at least, less active. August sees the great bulk of these trees bare. Few are the non-deciduous trees in Nyasaland, for though by stream and river one sees an evergreen line, it is situation rather than habit that accounts for it.

When I say that Nyasaland is well-wooded, it is not to be understood that we have anything approaching the forests of the Amazons, or the districts recently traversed by Stanley. Ascend hill or mountain and you overlook an apparently densely wooded country, with occasional dark patches of primeval forest, whilst well-defined lines, prominently above the surrounding woodland, indicate the existence of streams or moisture. On close examination this forest proves to be only collectively so; the great bulk of the trees that constitute forest in Nyasaland being from 4 to 12 inches in diameter, and from 8 to 16 feet in height. There are, however, places where this description would not be applicable, and where trees have attained greater size in girth and height, and stand widely apart; the intervening spaces being covered by low scrub and bush. On the plains of both the Lower and Upper Shire, a marked feature of the landscape is formed by groups of giant acacias and others distinctly separate from one another, fringed by tangled briar and straggling thorn, as if Nature had resorted to a picturesque though artificial method of arrangement in adorning what would otherwise be a monotonous plain. The baobab and *kigelia* are ubiquitous. The acacia, in the struggle for existence, has acquired the property of exclusively establishing itself in deep dark soil, on level plain or mountain slope. *Khaya senegalensis*, the great canoe tree, *Erythrophloeum guineense*, the bark of which is used in the poison ordeal, *Parkia filicordia*, *Albizia fastigiata*, *Eugenia cordata*, and species of *Ficus* constitute the leading features of arboreal life by stream-side in the highlands; while species of *Pterocarpus*, *Terminalia*, *Vitex*, *Lonchocarpus*, *Napuca*, *Brachystegia*, preponderate on the undulating plateaux, vast tracts being covered almost exclusively by species of the last-mentioned genera. Recently there has been brought to light a species of conifer of the genus *Widdringtonia*, found on the top of Milanje at an elevation of 6000 feet. These trees measure in some cases 54 feet in diameter, at 6 from their base, with a clear straight stem of 90 feet, the crown attaining to a height of 160 feet. These arboreal monsters were first brought to our notice by the late Rev. Robert Clelland; the investigation and procuring specimens of them is due to Mr. Alexander Whyte, Naturalist to the British Central Africa Administration, who has already done much, and will doubtless accomplish more in bringing to light hidden objects of scientific interest in Nyasaland. There are already growing in the Residency garden numerous seedlings of this tree, and as the timber is of a valuable nature, efforts will be made to plant it extensively.

From a utilitarian point of view, Nyasaland may be said to be decidedly wanting in timber, though that there are certain available and valuable woods there can be no question. On the lower Shire and Zambesi a *Pterocarpus*, a kind of almg, is used largely for boat-building; natural knees of the *Kigelia* form durable ribs for boats; *Eugenia cordata* and kindred species we have found to be excellent timber, close-grained, easy to work, and possessing the invaluable quality of lasting well in water, as experienced in a water-wheel at Zomba. It is worthy of notice that this tree is only to be found in wet situations, found often where no other save an imbibing *Ficus* would survive. *Terminalia* is also a good wood, short-grained and strong; in *Khaya senegalensis*, the canoe-tree of Nyasaland, we have a first-class wood, a kind of coarse mahogany. In a species of *Bridelia* we have a wood almost equal to walnut; in *Erythrophloeum guineense* we have a kind of coarse teak almost imperishable. *Vitex umbrosa* affords a wood light and easily worked, useful for furniture or inside work, where it can be protected; while the *Napuca kirki*, though



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the most common, is perhaps the most useful, certainly the most extensively used wood in the Shire Highlands. For bridge-building, where durability and great strength are required, Mwenya, a tree resembling a giant larch, with rhododendron-shaped leaves and a wood so dense as to sink to the bottom in water, cannot be beaten. Few are the woods that stand exposure to wind and weather in Africa; fewer still that are proof against the ravages of white ants. We have, however, in *Pterocarpus*, *Bridelia*, and *Erythrophloeum*, specimens possessing this quality. I have seen trunks of the first that have lain on the surface for twenty years in a good state of preservation; while in a species of *Louchocarpus*, a bastard rosewood, we have a timber that will for years, underground, defy the ravages of termites. The weak point in Nyasaland timber-supply is not that trees are wanting, but that wood of a durable workable quality, obtainable in large quantities, is not to be had. Notwithstanding there being no likelihood of a cubic foot of timber being exported for commercial purposes, we need not take a too pessimistic view of the case; for with better methods of treatment of timber, preservation and conservation of forest, and the amelioration of the present system of native agriculture, whereby, as in the case of Blantyre and Mandala, the country has been virtually devastated, together with a little attention paid by white settlers to reafforesting, timber sufficient to meet internal requirements will always be forthcoming. Already a good deal has been done in the way of introducing blue gum and other trees, and though, in the case of a eucalyptus avenue planted at Zomba, white ants attacked and destroyed the *living* trees; there is at Blantyre a eucalyptus avenue, planted in 1879, boasting of trees 2 feet in diameter, and close on 100 feet in height, *Eucalyptus globulus* being the quickest grower.

Passing to the soil, on which a country's wealth so largely depends, Nyasaland possesses a great diversity. In the Shire and other valleys there are large tracts of alluvial deposit capable of producing enormous crops of grain, rice, sugarcane, oilseeds, cotton, etc., but it is to the undulating table-land and mountain-slopes where Europeans can live, and where crops are moderately secure from flooded rivers and excessive moisture, that we must look for the profits of labour. The surface soil of Nyasaland, varying in depth from 4 inches to several feet, greatly diversified in quality, and ranging in colour from a light-blue sand to a jet-black loam, rests generally on a ferruginous clayey subsoil, which again rests upon coarse, rotten granite, affording ample scope for the exercise of skill and agricultural knowledge in the selection of land. Native agriculture, though possessing great interest, must, I fear, be passed over. Suffice it to say that while the devastation of forest is most reprehensible, and the natives themselves cannot give you any reason for their system, they in a sense, practice the essence of agriculture in their methods of maize and sorghum and sweet-potato cultivation, in which ashes and burnt earth play a prominent part, notwithstanding the great waste.

Several of the food-stuffs at present cultivated in Nyasaland are of comparatively recent introduction; and one can trace various food-producing plants already reverted to a wild state that had been cultivated prior to the introduction of maize, cassava, sweet potatoes, etc., and still available, though sadly deteriorated, in seasons of hunger. Crops cultivated by the natives may be summed up in maize, sorghum, rice, millet, beans, sweet-potatoes, yams, bananas, ground-nuts, sem-sem, ginger, turmeric, cotton, hemp, and tobacco; all of which, according to soil and locality, grow freely, and yield abundantly.

We have now to look at our subject from a purely commercial point of view. We have, to start with, in Nyasaland the cardinal elements of commerce. In many parts soil of almost unlimited fertility, abundance of land of average richness, a comparatively healthy climate, natives who, taking them all round, are far

beyond the average African in point of intelligence and willingness to work, access to the London market, which will improve, and security to life and property afforded by the British Central Africa Administration. I have already stated that grain in the shape of maize, rice, sorghum, beans, etc., can be grown to an unlimited extent; the home demand, however, in an ordinary season, meets the supply, and a high freight nullifies any attempt to grow these grains for export. On the Zambesi a species of wheat is grown which, though not very prolific, produces flour of superior quality, and finds a ready market among the Portuguese and other Europeans on the coast. In the Shiré Highlands European wheat has been grown successfully from time to time, though on several occasions rust proved a deadly foe. Sem-sem and ground nuts support a large trade on the Zambesi and Shiré, and are a sure article of export and a greatly extended cultivation of this product on the lowlands may be reasonably anticipated. Flax, too, we found to grow well in ordinarily good soil. Castor-oil plants (*Ricinus*) are weeds everywhere, there being nearly thirty varieties. The seeds are worth in London about £8 per ton. Cotton grows on plain and hill. The indigenous variety has been reported upon as being too short in the staple to be of value as an article of export, its probable use being for the manufacture of candlewick, but we have introduced several leading Egyptian and American varieties, all of which were doing well.

As to fibres, we have species of *Sansevieria* on hill and plain, which are worth in the London market from £20 to £40 per ton. The natives make rope from the *Sansevieria longifolia*, which they sell to the Europeans. On the shores of Lake Nyasa, and at Cape Maclear in particular, is a bush known as "tingo." This plant, resembling a willow in habits, sends up a number of hazel-like shoots from 2 to 5 feet in length, which, on being cut and the outer bark scraped off, are laid for a few hours in the sun; afterwards the inner bark is removed and manufactured by rubbing and washing, and then spun into twine, the loom being the human limb. Fishing-nets are made of this twine, and resist the action of the water for a considerable period. Nets for the chase are made from the inner bark of the baobab. From the liber of the "njombo," the *Brachystegia longifolia*, and kindred species, as also from species of *Ficus*, the native bark cloth is made. The last-named, as cloth and cordage enters so largely into the economy of everyday life, that on the lake ficus-trees have become heritable property, while the "njombo" and others, through their accommodating facilities, have so impressed the native mind with the idea of tying, that the verb build has no place in their language, no structure being built but *tied*. Is it not too much to express the hope that these bark-cloth trees, which have played so prominent a part down the roll of Africa's dark days, may find a still higher use in these advancing times. Both reha and aloe fibre plants (*Fourcroya gigantea*) have been introduced and grow luxuriantly. As to rubber, several species of *Landolphia* are found all over the country, and good prices have been obtained in the London market. The supply, however, is fast disappearing; the native method of collecting is most destructive, and it seems hopeless to educate the natives in this respect owing to their advanced ideas regarding the common rights of property.

I need hardly refer to ivory. Every one has heard of the terrible evils connected with this trade. There must still be great stores of ivory in the interior of Africa. I need not burden this paper by detailing such articles as hides and horns, gums, chillies, ginger, turmeric, etc. These, and others I have mentioned, are marketable, and may become valuable commodities. Much depends upon cheap freight and upon speedy communication with the London market.

But we still want a staple; we want a commercial backbone. No; we are sanguine enough to believe we have found this in coffee. It is now fourteen

years since, through the kindness of the late Professor Balfour, three coffee plants were presented to the Blantyre Mission. These plants were packed in moss in a flat box, and under the care of Mr. Duncan, who occasionally opened the box and damped the moss, they reached Blantyre after a three months' journey. Two of the three subsequently died, one each of *Coffea Arabica* and *C. Liberica*; the other *C. Arabica* survived, at first grew slowly, but ultimately blossomed forth into flower and fruit. Progress in coffee planting was at first slow, and attended with great risk, the real impetus being given by the declaration of a British Protectorate in 1889. The season of 1892-93 will see about ten million coffee plants planted out in the Shiré Highlands, and this we believe is but the day of small things. Coffee grown by Messrs. Buchanan Bros. at Zomba has fetched a high price in the London market, the feature of the Shiré Highland coffee being a small but compact bean of high flavour. There are of course certain difficulties in the way of coffee extension and successful cultivation, as in everything else. The labour question is already exercising the minds of most planters. We have suffered a good deal from what we might term the "empty-berry-foe"; borer, too, is ever cropping up, but nothing approaching *Hemitea vastatrix* has been observed.

As I have stated, the coffee at first grown was *Coffea Arabica*. We have now, however, Blue Mountain and Orange coffee, as also *Coffea Liberica*. Blue Mountain coffee seems well suited for an elevation of 3000 feet, while the "Orange" coffee, though it bears well at that elevation, is less hardy. *Coffea Liberica* produces fruit at Blantyre at an elevation of 3300 feet above sea-level, but at that elevation it would not be a profitable crop. Much may be done with it, however, on the lowlands.

Another species, the *Coffea Mozambiquensis*, is worthy of notice. Presumably indigenous to the country, though so far as I know confined to the sea-level, it has proved itself capable of resisting intense drought at an elevation of over 3000 feet. It has the peculiarity of completely shedding its leaves before coming into flower, it is in fact deciduous. It is a perfectly distinct species both in leaf and fruit and habit of growth. The fruit is very small, but ripens in an incredibly short time.

As to tea, an experiment of 20 acres is being tried at Zomba. Tea has been grown in the Blantyre Mission garden for years, but, considering the present absurdly cheap price of tea, and bearing in view the necessity for having an absolute command of labour for its growth at a time when the natives are most busy with their own gardens, I think it doubtful whether tea will ever rank as a paying product in any part of Central Africa.

Ceara rubber we have introduced, and found it to grow well. There is a great possibility in Ceara rubber, but immediate returns must not be looked for. Notwithstanding the nonsense that has been written as to Ceara requiring only a few stones drawn together, or a hole made with a crowbar and a cutting inserted to ensure success, our Nyasaland experience is, that no plant is more partial to good soil, nor less likely to repay the planter in a bad one.

Alongside of coffee may be considered cocoa cultivation; the difficulty of securing a supply of plants has been, hitherto, the drawback. This, however, has been overcome, and success is anticipated.

Cinchona may be looked on as an auxiliary. A small parcel of four-year-old bark of so-called Calisaya Verde, grown at Zomba, at an elevation of 3000 feet, realised 4d. per pound. The following is an analysis of the sample.

Crystallised sulphate of quinine	3.81 per cent.
Cinchonidine	1.42 "
Quinidine	0.15 "
Cinchonine alkaloids	0.56 "

Though the palmy days of cinchona cultivation have long since departed, given land and labour cheap and plentiful, there is yet a great possibility in cinchona to the man who can afford to wait.

Sugar might be cultivated to an unlimited extent on the lowlands. It is grown and manufactured at Zomba for local consumption; but as it is practically a two-year crop in the highlands, profits from it are small. I have never looked upon sugar as an article of export from Nyasaland, though local demand can always be met.

Tobacco is cultivated by the natives and cured in different ways, and some of this article as manufactured by them is highly prized. From imported seed a finer leafed tobacco has been raised, and a sample of Zomba tobacco was described by a London broker as the finest yet seen from Africa. The native tobacco lies under the disadvantage of being coarse-veined, thick and heavy in every way, totally unsuited for any save the coarsest uses in the home market. Both cut tobacco, cheroots, and cigars, are being manufactured at Zomba for local supply, and, while this is met, planters may look forward to exporting the raw material. A superior tobacco can be cultivated; experience in curing and growing will adapt it to the market.

I feel justified in saying that, commercially, Nyasaland has a bright future before it. We have the backbone of commerce in coffee, cocoa, rubber, tobacco, cotton, cinchona, and it may be, tea, and sugar, and in an already organised trade in oilseeds, capable of unlimited extension, with great probabilities in fibres, grain, hides, beeswax, etc., not to speak of the ivory trade, which will hold its own for several years yet to come.

The development of Nyasaland, considering the circumstances, has been I believe, unique. In June of last year 1891, we entered upon a new régime. It is unnecessary in this place to do more than mention the fact that a Commissioner, in the person of Mr. H. H. Johnston, C.B., sent out by Her Majesty's Government, began to administer the country.

Before concluding, I wish merely to ventilate a railway scheme for British Central Africa which has been in my mind for years. It is simply that we should construct a railway from the Shire to Lake Nyasa, making Chiromo at the mouth of the Ruo our starting-point, and subsequently another line to connect Nyasa and Tanganyika. For the first project alone a sum of about £500,000 would be necessary. It seems a large sum, but we may as well look the matter in the face at once, for a few years hence the money will have to be forthcoming.

It needs no prophet to foretell that the lion's share of the work of developing Central Africa, and putting down the slave-trade, has fallen upon Britain's shoulders, and as a nation she can no more shirk her responsibility than can an individual his duty. Central Africa calls aloud for development, and I hold, with pride too, that of all nations on the face of the earth, Britain is the most fit for the work.

THE CONSTRUCTION OF A MAP OF THE WORLD ON A SCALE OF 1:1,000,000.

By Professor Dr. A. PENCK.

RECENT years have witnessed the accumulation of an enormous mass of geographical information, laid down on maps of a comparatively large scale. We have maps on a scale of 1:200,000 (3·15 miles to 1 inch) of nearly all Europe, large tracts of North America, and portions of Africa and the Indian Empire.

More than two-thirds of the whole extent of coast-line of our continents and islands are mapped on a not much smaller scale. Several of the Central and South American States, Australia, and a large portion of Western, Southern, and Eastern Asia, are mapped on scales varying between 1:500,000 (7·89 miles to 1 inch) and 1:1,000,000 (15·78 miles to 1 inch), while itineraries through the wilds of South America and Africa are now frequently laid down on larger scales than that of 1:1,000,000.

Various circumstances tend to considerably reduce the scientific and practical value of this enormous mass of accumulated information. The maps on which it is laid down are not uniform either in scale, projection, or style of execution; they are published at different places all over the world, and are often difficult to obtain. Some are only published in journals, and cannot be had separately, while others, for one reason or another, are not put in the market at all.

The circumstances and interests of our civilised life make good maps almost a necessity. Maps of our own country are absolutely indispensable; commercial interests, missionary undertakings, and colonial enterprise create a demand for maps of foreign countries, while of the maps required for educational purposes and as illustrations of contemporary history, the name is legion.

The compilation of all the existing cartographical material and its condensation into an atlas of the world, would be a work of great practical as well as scientific value, especially for nations having considerable Colonial possessions. A uniform map of the world would be at the same time a uniform map of the British Empire, showing not only the actual territory under British authority, but also the sphere of British commercial activity, and would serve the varied purposes of administration, navigation, and commerce. The desire for maps which shall show a country not merely as a piece of land limited by political boundaries, but as a region in the frame of its natural surroundings, has led to the execution not only of general maps of large portions of Central Europe by the German, French, and Austrian staffs, but also to the production of a large scale map of a whole continent—Africa.

The consideration by the Fifth International Congress (held at Berne, 1891) of the scheme for the execution of a map of the world on the scale of 1:1,000,000 (15·78 miles to 1 inch), was a step in the right direction. On that occasion the author of this paper gave a short sketch of his scheme,* which he had previously treated of in a preliminary note.† De Lannoy de Bissy, the author of the map of Africa on the scale of 1:2,000,000 (31·56 miles to 1 inch), gave his approval,‡ and after receiving the report of a committee, the Congress appointed an International Commission for the investigation of the scheme.§ Dr. Richard Lüddecke of Gotha has since started a discussion on the subject in the pages of *Ausland* || in which

* A. Penck. Die Herstellung einer einheitlichen Erdkarte im Maasstabe von 1:1,000,000 (*Annales du Congrès*, Annexe IV.).

† A. Penck. Die Erdkarte im Maasstabe von 1:1,000,000 (*Beilage zur Allgemeinen Zeitung*, Munich, 1891, No. 169: June 20).

A. E. Forster. Über die Herstellung einer Karte im Maasstabe von 1:1,000,000 (*Das Ausland*, No. 31: 1891).

‡ De Lannoy de Bissy. Quelques détails sur la carte de l'Afrique au 2,000,000^{me} à propos de la question de l'élaboration d'une carte de la terre à l'échelle du 1,000,000^{me} (*Annales du Congrès*, Annexe V.). Also published separately ('Imprimerie Fricotel,' Epinal).

§ Première Résolution votée dans la séance de clôture.

|| R. Lüddecke. Zur Erdkarte im Maasstabe von 1:1,000,000 (*Ausland*, No. 46: 1891). Noch einmal zur Erdkarte im Maasstabe von 1:1,000,000 (*Ausland*, No. 11: 1892).

Dr. H. Habenicht (Gotha),* Dr. E. Hammer (Stuttgart),† and the author of this paper have taken part,‡ the main points discussed being the scale and projection of the map. It will be remembered, however, that on both of these points the Congress had already expressed an opinion, the scale of 1:1,000,000 being approved and the division of the sheets by meridians and parallels being accepted by preference.

A comparison of the scales usually employed in the construction of general maps of extensive tracts of country will show that they range between 1:200,000 (3·15 miles to 1 inch), and 1:1,000,000. Smaller scales are but rarely employed in the construction of general maps of large portions of Europe; on the other hand, maps of European States in the best atlases rarely have larger scales than that of 1:1,500,000 (23·67 miles to 1 inch). In order to fulfil its purpose, so far as Europe is concerned, a map of the kind proposed must be executed on a scale not larger than 1:1,000,000, nor smaller than 1:1,500,000.

It must be confessed that for some parts of the world the scale of 1:1,000,000, in view of the present state of our knowledge, is much too large, but these tracts become more and more limited every year, and though twenty years ago a map of Africa on a larger scale than 1:5,000,000 would have seemed an impossibility, we now have a map of that continent on a scale of 1:2,000,000, and as long ago as 1885 the author of that great work was able to express the opinion that in ten years the scale of 1:1,000,000 would be the smallest on which our knowledge of Africa could be done justice to. In fact portions of Inner Africa are now mapped on the scale of 1:300,000, large tracts on scales ranging between 1:750,000 and 1:1,000,000, while similar scales are frequently used for route maps. It will be seen that in districts at all thickly populated from twenty to fifty place-names will go to the inch.

An advantage of the scale proposed is that it corresponds almost exactly to that of the Indian Government's 16 miles to the inch map of the Indian Empire and neighbouring countries, so that one-seventh of Asia may be said to be already mapped on this scale. Further it differs but little from the Russian military map of Russian and Turkish Asia (1:840,000 and 1:1,680,000). Moreover, the French and Dutch have given us maps of Further India and the East Indian Islands respectively, on the scale of 1:1,000,000, which is also used for the maps of the Transvaal and of certain Central and South American States.

It may further be mentioned that 10 per cent. of all the African maps in *Petermann's Mitteilungen* are on this scale, as also many maps published in the *Proceedings* of the Royal Geographical Society. If De Lannoy de Bissy already considers the scale of 1:2,000,000 too small for Africa, we may safely assume that the same is true with regard to the other continents, and that the proposed scale of 1:1,000,000 is in every respect the most suitable. Lüddecke has denied this, and declared that for certain parts of the earth such scales as 1:3,000,000 (47·34 miles to an inch) or even 1:4,000,000 (63·13 miles to 1 inch) would meet the requirements. The latter scale is most certainly too small. It will not allow of an adequate representation of the whole of our topographical and orographical knowledge of the earth's surface even in those districts which as yet are not fully surveyed, while in regions which are completely mapped such a scale would limit

* H. Habenicht. (*Ausland*, Nos. 1 and 19: 1892).

† E. Hammer. Zur Projektion der Erdkarte 1:1,000,000 (*Ausland*, No. 40: 1892).

‡ A. Penck. Zur Erdkarte im Massstabe von 1:1,000,000 (*Ausland*, No. 52: 1891; No. 19: 1892).

the amount of detail which could be inserted to such an extent as to materially prejudice the practical utility of the map.

A moment's consideration of existing maps of the kind will show the truth of this statement. Stieler's atlas has maps on the scale of 1:3,700,000 (58·38 miles to 1 inch) of Europe and the United States. South and Central Europe are also given on the scale of 1:1,500,000 (23·67 miles to 1 inch). The maps of countries not so favoured are very evidently too crowded. The scale of 1:3,700,000 must therefore be looked upon as distinctly too small for a map such as that proposed. Still, though for some parts of the earth even the scale of 1:2,000,000 may be too large, it must be borne in mind that the object of this scheme is to condense all our geographical knowledge, and place it upon a map which shall give a representation of the earth's surface uniform both in scale and style of execution. It appears from a paper by Mr. J. G. Bartholemew* that 56 per cent. of the land surface of the globe has already been fully surveyed, while only 12 per cent. can be described as unexplored. It is therefore apparent that only for one-eighth of the land surface of the globe could the scale of 1:1,000,000 be considered too large, while for one-half it might rather be considered too small.

During the many years that will be occupied in the execution of the map, the unexplored areas will be greatly reduced, and it would hardly seem worth while on their account to choose a smaller scale than is otherwise suitable.

Equally absurd would be the adoption of a smaller scale for these regions, as such a measure would make the map useless for purposes of measurement and comparison.

In addition to the general advantages hitherto claimed for the scale of 1:1,000,000, there is the special advantage that any metre-measure can be used as a scale for a map constructed on this scale, which, moreover, allowing for paper shrinkage is for all practical purposes identical with that of 16 miles to the inch (1:1,013,760) and 25 versts to the inch (1:1,050,000). It must be borne in mind that the sheets of this map are not intended to be joined together so as to form a map of the whole world or even of a single continent. Asia on this scale would cover 30 feet square. For such a purpose maps on a smaller scale or in a different style of execution would be needed. It might rather be described as an "Atlas of the World," the term being used in the sense in which it is applied to the large-scale maps of certain countries, the separate sheets of which no one would attempt to piece together into a map of the whole country.

This being the case there is no need for a projection such as that described by Sir Henry James (R.G.S. *Journal*, Vol. XXX., p. 106), which allows of the representation of a large extent of the earth's surface on one plane; the projection known as the polyhedric, employed for the ordnance maps of Germany, the Austro-Hungarian Empire, the United States and Japan, and the Indian Transfrontier maps, would meet the requirements. There are two methods of carrying out this projection; it can either be done separately for each section or on truncated cones corresponding to successive zones of the map. The first method produces rectilinear trapezes, and adjoining sheets of the same column or zone can be fitted together with mathematical accuracy. There is, however, a certain amount of distortion towards the edges, and the parallels of latitude do not appear as continuous curves when two sheets are fitted together. The second method gives us non-rectilinear trapezes, which can be accurately fitted together within the same zone only. The distortion is, however, considerably less, and the sheets even of different zones will fit together at least as well as paper-shrinkage allows the sheets of a map projected on to a plane to fit together.

* *Scott. Geog. Mag.*, 1890, pp. 293, 575; 1891, pp. 124, 586.

It appears that the discrepancy between the size of such a sheet and the area of the Earth's surface which it represents increases approximately with the square of its size, so that the smaller the sections, the more accurate the map. On the other hand, the larger the sections the smaller the cost of printing the whole map.

Practical considerations make a division of the map into 3° or 5° zones advisable, these being the only divisors of 90° that will give sheets of a convenient size on the scale of 1:1,000,000. Even the inaccuracy in 5° sections is not as great as that caused by paper-shrinkage. For all practical purposes then we may look upon the projection of the map on 3° or 5° sections as mathematically accurate. There is no need for an equivalent projection of each separate section. This would produce curved meridians, and render the joining together of sheets within the same zone impossible.

Towards the poles the longitudinal extent of the sections is, of course, reduced. On the parallel of 60° it is but half of what it was on the Equator. It would seem advisable then to divide the zones between the poles and 60° into half as many columns as between 60° and the Equator. This would make it possible to have the sheets of the map as nearly as possible of equal size, without making a change in their division, which would complicate the numbering of the sheets. Several considerations point to a division of the map into 5° sections as in every respect the most suitable. Both the single-column sheets between the Equator and 60° and the double-column sheets between 60° and the pole will be found to have a handy size, while for purposes of numeration a division which adapts itself to the decimal system is certainly the best.

Dr. Lüddecke mentions as one of the greatest drawbacks of the polyhedric projection the impossibility of fitting any number of sheets together. We have already seen that it allows adjoining sheets of the same zone to be fitted together with mathematical accuracy. Owing to the difference between the radii of the parallels of latitude it will be seen that if sheets of different zones are grouped symmetrically on either side of a meridian, there is a gap between adjoining zones, which increases by geometrical progression with every column's distance from the central meridian. These inaccuracies, however, are for adjoining sheets not greater than those caused by paper-shrinkage; and when we consider that it cannot possibly serve any practical purpose to fit more than nine sheets together, we may safely disregard this objection of Dr. Lüddecke's. Nine sheets of the map would cover a surface of nearly 6 feet square, about as large an extent as can be conveniently overlooked, and even in this case the greatest extent of the gap between the sheets would not be more than $\frac{1}{2}$ of an inch. This refers to sections near the equator; nearer the poles the gaps are even smaller. The widespread use of the Greenwich meridian makes its adoption in the construction of this map seem advisable. De Lannoy de Bissy recommends the subsidiary insertion of longitudes counted from other meridians.

Sea, rivers, and lakes should be shown in blue; the map should contain as much information as possible regarding tides, variations in the extent of lakes, sea-depths, swamps, &c.

In order to give a really satisfactory representation of the relief of the earth's surface, the map should show both the absolute and the relative elevation. This can really only be done satisfactorily by a combination of contours with colouring, either as hypsographical surface colouring varying with the elevation, or as shading to show steepness. Either of these methods has some disadvantages; and the best plan would, therefore, seem to be a combination of both: the relative elevation being shown by hachures, and the absolute elevation by the insertion of a limited number of contours in conjunction with hypsographical surface colouring.

Four contours would seem to suffice, drawn at 100 (328 feet), 300 (984 feet),

500 (1640 feet), and 1200 (3937 feet), mètres elevation. They would only be inserted where our knowledge enables us to do so with accuracy; elsewhere the elevation would be vaguely indicated by the hypsographical colouring.

Known elevations should be inserted. The foot, which is used by practically one-third of the human race is too small, the mètre being much handier; no elevations would require to be written in more than four figures, and there is the advantage of the decimal system. A further saving of space might be made by the adoption of the decamètre (32·81 feet) in view of the fact that only in those countries which have been completely mapped, is it possible to give elevations correct to a mètre, so that the elevations would need only three figures.

The boundaries of States should be shown in black, perhaps edged with a narrow strip of colour. The boundaries of minor political divisions, such as French departments and English counties, may be omitted. All railways, the more important roads, lines of telegraph, the limits of navigation on rivers, should be shown. The scale of the map will not allow an indication of the relative extent of forest, arable land, and pasture, but an indication of at least the first of these might be possible.

In fully surveyed and thickly populated districts a judicious selection will have to be made of the towns and villages to be inserted. As much information as possible relating to means of communication by land or water should be given, railway-stations and harbours indicated, and notable centres of any special industry marked as such. In partially explored regions all known place-names should be inserted, a distinction being drawn between permanent and temporary habitations.

The question of spelling is one of the most difficult connected with the map. The fact that different nations pronounce the same letter differently would seem to make a uniform system of *phonetic* spelling desirable; but this is impossible for obvious reasons.

The principle to be adopted may be shortly stated as follows: The Latin alphabet alone should be used; and for each country together with its colonies and sphere of influence, the official spelling should be adopted. In some cases, as when more than one language is spoken within one State, the unofficial form of the name could be inserted in brackets, *e.g.*, Bruxelles (Brussels), Lemberg (Lwów), Derpt (Dorpat). For countries in which the Latin alphabet is not used, the place-names should be transliterated. In the case of certain countries (*e.g.* Russia) it might be possible to issue a special edition with the original lettering. The lettering would then have to be on a separate stone.

The number of stones required for the printing of one sheet would be six:

(1) Water	.	.	.	.	.	Blue.
(2) Hills	.	.	.	.	.	Brown.
(3), (4), and (5) Hypsography	.	.	.	.	.	3 colours.
(6) Outline and lettering.	.	.	.	.	.	Black.

This number might be reduced by such expedients as the combination of (1), and (6), or the insertion of figures showing heights above sea-level in place of the hypsographical colouring. This however is not advisable.

If the sections of the map are made to correspond with 5° trapezes, they will number 880. If between the parallels of 60° and the poles the sections are made to include 5° of latitude by 10° of longitude, the total number will be 769. It will be found advisable to extend a certain number of sheets (49) longitudinally, so as to include small tracts of land which it would not be worth while to represent on separate sheets. In twenty-seven cases an extension latitudinally will be found convenient.

The few isolated islands which do not find a place on one or other of the sections may be shown on insets.

Each section is indicated by the numbers of the zone and column to which it belongs, and moreover bears the name of the principal town or some important physical feature; for example, sheet New York, Zone IX. N., Column 15 W. Each sheet must bear scales of the measures in use in the region to which it refers, and the date of its publication, and must indicate the system of spelling adopted. Sections representing countries which are fully explored may well be engraved on copper, while for others lithography should be employed.

Certain sets of sections should be accompanied by explanatory memoirs. These would contain:—

1. An account of material used in the compilation of the map.
2. An index of place-names, giving their geographical position.

The complete map will cover an area of 2127 square feet. The cost of production may be set at about £9 per square foot for an edition of 1,000 copies. If the whole edition were sold at 2s. a sheet, there would be a deficit of over £100,000. This is a large sum, but larger sums have been spent ere now on scientific objects, instance the expenditure on Arctic exploration in the forties and fifties and on African exploration more recently. We may also mention the expenditure of a sum equal to the above-mentioned deficit for a year's meteorological observation in the Arctic regions; further that in consequence of a vote of the International Astronomical Congress at Paris (1887), the execution of a complete map of the heavens on an even larger scale than that of the proposed map of the earth has been undertaken.

The following table will show the number of sheets which will fall to the share of each country:—

British Empire	222	German Empire	21
(Including 57 double-column sheets)		Turkey	18
Russia	192	Spain	16
(Including 100 double-column sheets)		Argentine Republic	15
United States	65	Mexico	13
(Including 12 double-column sheets)		Italy	10
France	55	Japan	10
Scandinavia	54	Portugal	8
(Including 51 double-column sheets,		Congo State	8
12 sheets go to the interior of		Austria-Hungary	7
Greenland.)		Chile	7
China	45	Central American States	6
Brazil	28	Persia	4
Egypt and North Africa	27	Belgium	1
Netherlands	24	Switzerland	1
Venezuela, Colombia, Ecuador, Peru,		Greece	1
and Bolivia	23	Islands	3

More than three-quarters of the whole number of sheets thus fall to the share of ten States. If these countries give their approval to the scheme, its success will be assured, even if in some cases the work has to be done by private individuals or at the expense of geographical societies instead of by Government.

The International Commission is pledged to the careful consideration of all points bearing on the scientific and practical utility of the map and the feasibility of the scheme. Their labour may be materially lightened if they are accorded assistance, by scientific and practical geographers, in the form of suggestions and criticism. The execution of a map of any region in the manner described above would be a valuable experiment.

DIMENSIONS OF 5° TRAPEZOIDS ON THE SCALE OF 1:1,000,000, AND ELEMENTS FOR THEIR CONSTRUCTION.

Zones.		Length of the Parallels of Latitude Limiting the Sheets.	Length of the Central Meridian.	Area of the Earth's Surface represented by one Sheet. (to scale.)	Area of the Sheet.	Difference.
Zone		millimètres.	millimètres.	sq. millimètres.	sq. millimètres.	sq. millims.
I.	($P_0 = 550,5$)		$m_1 = 552,8$	$F_1 = 307282$	$B_1 = 307088$	$D_1 = 194$
II.	($P_1 = 554,4$)		$m_2 = 552,9$	$F_2 = 305004$	$B_2 = 304812$	$D_2 = 192$
III.	($P_2 = 548,1$)		$m_3 = 553,1$	$F_3 = 300463$	$B_3 = 300274$	$D_3 = 189$
IV.	($P_3 = 537,7$)		$m_4 = 553,3$	$F_4 = 293685$	$B_4 = 293500$	$D_4 = 185$
V.	($P_4 = 523,2$)		$m_5 = 553,6$	$F_5 = 284709$	$B_5 = 284530$	$D_5 = 179$
VI.	($P_5 = 504,7$)		$m_6 = 554,0$	$F_6 = 273591$	$B_6 = 273419$	$D_6 = 172$
VII.	($P_6 = 482,4$)		$m_7 = 554,4$	$F_7 = 260399$	$B_7 = 260234$	$D_7 = 165$
VIII.	($P_7 = 456,4$)		$m_8 = 554,9$	$F_8 = 245217$	$B_8 = 245062$	$D_8 = 155$
IX.	($P_8 = 426,9$)		$m_9 = 555,4$	$F_9 = 228146$	$B_9 = 228002$	$D_9 = 144$
X.	($P_9 = 394,2$)		$m_{10} = 555,8$	$F_{10} = 209301$	$B_{10} = 209169$	$D_{10} = 132$
XI.	($P_{10} = 358,4$)		$m_{11} = 556,3$	$F_{11} = 188814$	$B_{11} = 188694$	$D_{11} = 120$
XII.	($P_{11} = 319,9$)		$m_{12} = 556,8$	$F_{12} = 166832$	$B_{12} = 166726$	$D_{12} = 106$
XIII.	($P_{12} = 279,0$)		$m_{13} = 557,2$	$F_{13} = 143518$	$B_{13} = 143427$	$D_{13} = 91$
XIV.	($P_{13} = 235,8$)		$m_{14} = 557,6$	$F_{14} = 119050$	$B_{14} = 118977$	$D_{14} = 73$
XV.	($P_{14} = 190,9$)		$m_{15} = 557,9$	$F_{15} = 93617$	$B_{15} = 93558$	$D_{15} = 59$
XVI.	($P_{15} = 144,5$)		$m_{16} = 558,1$	$F_{16} = 67423$	$B_{16} = 67380$	$D_{16} = 43$
XVII.	($P_{16} = 97,0$)		$m_{17} = 558,3$	$F_{17} = 40676$	$B_{17} = 40650$	$D_{17} = 26$
XVIII.	($P_{17} = 48,7$)		$m_{18} = 558,4$	$F_{18} = 13596$	$B_{18} = 13587$	$D_{18} = 9$
	($P_{18} = 0,0$)					

Radii of the Parallels.	Half Chords of the Parallels.	Distance of the Chords from the Parallels.
millimètres.	millimètres.	millimètres.
$R_0 = 140231$	$S_0 = 278,3$	$T_0 = 0,27$
$r_1 = 145678$	$s_1 = 277,2$	$t_1 = 0,26$
$R_1 = 48090,1$	$S_1 = 277,2$	$T_1 = 0,79$
$r_2 = 48137,2$	$s_2 = 274,1$	$t_2 = 0,78$
$R_2 = 29027,4$	$S_2 = 274,1$	$T_2 = 1,29$
$r_3 = 28474,3$	$s_3 = 268,8$	$t_3 = 1,27$
$R_3 = 20498,5$	$S_3 = 268,8$	$T_3 = 1,76$
$r_4 = 19945,1$	$s_4 = 261,6$	$t_4 = 1,71$
$R_4 = 15671,8$	$S_4 = 261,6$	$T_4 = 2,18$
$r_5 = 15118,2$	$s_5 = 252,3$	$t_5 = 2,10$
$R_5 = 12528,0$	$S_5 = 252,3$	$T_5 = 2,54$
$r_6 = 11974,0$	$s_6 = 241,2$	$t_6 = 2,43$
$R_6 = 10290,8$	$S_6 = 241,2$	$T_6 = 2,83$
$r_7 = 9796,4$	$s_7 = 228,2$	$t_7 = 2,67$

Radii of the Parallels.	Half Chords of the Parallels.	Distances of the Chords from the Parallels.
millimètres.	millimètres.	millimètres.
R ₇ = 8593,7	S ₇ = 228,2	T ₇ = 3,03
r ₈ = 8038,8	s ₈ = 213,4	t ₈ = 2,83
R ₈ = 7243,4	S ₈ = 213,4	T ₈ = 3,14
r ₉ = 6688,0	s ₉ = 197,0	t ₉ = 2,90
R ₉ = 6128,8	S ₉ = 197,0	T ₉ = 3,17
r ₁₀ = 5572,9	s ₁₀ = 179,2	t ₁₀ = 2,88
R ₁₀ = 5178,8	S ₁₀ = 179,2	T ₁₀ = 3,10
r ₁₁ = 4622,5	s ₁₁ = 159,9	t ₁₁ = 2,77
R ₁₁ = 4318,2	S ₁₁ = 159,9	T ₁₁ = 2,94
r ₁₂ = 3791,5	s ₁₂ = 139,4	t ₁₂ = 2,57
R ₁₂ = 3605,1	S ₁₂ = 139,4	T ₁₂ = 2,70
r ₁₃ = 3047,9	s ₁₃ = 117,9	t ₁₃ = 2,28
R ₁₃ = 2926,4	S ₁₃ = 117,9	T ₁₃ = 2,38
r ₁₄ = 2368,8	s ₁₄ = 95,4	t ₁₄ = 1,92
R ₁₄ = 2294,6	S ₁₄ = 95,4	T ₁₄ = 1,99
r ₁₅ = 1736,7	s ₁₅ = 72,2	t ₁₅ = 1,50
R ₁₅ = 1696,5	S ₁₅ = 72,2	T ₁₅ = 1,54
r ₁₆ = 1138,5	s ₁₆ = 48,5	t ₁₆ = 1,03
R ₁₆ = 1121,0	S ₁₆ = 48,5	T ₁₆ = 1,05
r ₁₇ = 562,7	s ₁₇ = 24,3	t ₁₇ = 0,52
R ₁₇ = 558,4	S ₁₇ = 24,3	T ₁₇ = 0,53
r ₁₈ = 0,0	s ₁₈ = 0,0	t ₁₈ = 6,00

THE MONTHLY RECORD.

THE SOCIETY.

Mr. Conway's Expedition to the Karakoram.—Mr. Conway has returned from his expedition to the Karakoram with abundant and valuable results in the shape of diaries, maps, photographs, sketches (by Mr. A. D. McCormick), and collections of various kinds. The maps will be published by the Society, and Mr. Conway hopes to give an account of the work of the expedition at the meeting of the Society on May 8th.

Educational Lectures.—The Friday evening lectures on "The Relations of Geography to History in Europe and Asia," by Mr. H. J. Mackinder, continue to be well attended. The four concluding lectures will be given in March, the subjects being—"The Alps as a Factor in European History," "The Approaches to Italy," "The Division of Gaul," "Some Geographical Analyses of British History." It is hoped that in the April or May number of *The Geographical Journal*, a report in abstract of the whole series will be given, accompanied by diagrams. A revised edition of the lectures will be ultimately published in book form.

Bibliography of Morocco.—The last Supplementary Paper which has been issued, and is now ready to be delivered to Fellows on application at the Office, is singularly appropriate in its date of publication coinciding with the fresh interest taken in Moorish affairs in this country. It takes the form of an exhaustive Bibliography of Morocco, compiled by Sir Lambert Playfair and Dr. Robert Brown, and is the fourth part of the Bibliography of the Barbary States. The references have a wide range in time, the first entry being the work of Hecateus in B.C. 520; the last, No. 2062, a speech by the Marquess of Salisbury, reported in a daily paper of 1891. Besides these chronologically arranged entries there are one hundred and eighty-one references to papers in public records. Probably no work of any importance whatever down to the end of 1891 is omitted, and the bibliography is valuable not only as a convenient catalogue for reference but as a historical summary full of interesting biographical touches regarding early writers and explorers.

EUROPE.

Mr. Grundy's Surveys in Boeotia.—Geography touches at many points both History and Literature. The narratives of ancient historians have often been needlessly taxed with obscurity or incorrectness because large-scale contoured maps have not been procurable, and critics have been wanting in local knowledge or topographical faculty. In Italy the new survey (1:25,000) will probably do more than many volumes to elucidate classical sites and battlefields. In Greece, maps of this character have still to be produced by private enterprise. In Attica, Germany has done good cartographic work. Our Council recommended Mr. G. B. Grundy, of Brasenose College, the Student in Geography appointed by the Society and the University of Oxford jointly at the beginning of 1892, to give his attention to Boeotia. He has lately spent some weeks in that country in surveying the battlefields of Plataea and Leuctra and also the ruins remaining on the site of the town of Plataea itself. The weather, during almost the whole time he was in the country, was, unfortunately, very unfavourable for survey work, and he was obliged to give up his intention of mapping out the fields of Coronea, Chaeronea, and Orophomenus, and had time allowed it, that of Delium. The field of Plataea also involved far more work than he had expected, owing to the extreme irregularity of the ground, and the extent of it. The map he has made includes an area of 14 square miles, and is drawn on a scale of 8 inches to the mile. Midwinter is hardly an ideal time for survey work, but the circumstances of Greece generally, and Boeotia in particular, practically necessitate the carrying out of the work at this period of the year. It is only at this season that the ground is free from crops, and it is hardly likely that even the most patient husband-

men would submit without some expression of feeling on the subject to having their vines and corn trampled upon by a foreign intruder when the former are in leaf and the latter above ground. The special circumstance which applies to Boeotia is the danger of malaria in the region of Lake Copais, where it is peculiarly prevalent in the summer months. Mr. Grundy has good reason to know that immunity from this risk is not to be guaranteed even in the cold weather. The monograph, or monographs, in connection with the maps will require some little time to prepare, since in the cases at least of the battlefield and town of Plataea, it has been necessary to touch on much debated questions. The peculiar interest which attaches to the questions that relate to the field and the site respectively of Plataea, is due to the fact that modern commentators whose very names inspire respect, have considered it impossible to reconcile the evidence which is attainable on the ground at the present time with the accounts of events related in detail by Herodotus and Thucydides as having taken place on that ground. It has been Mr. Grundy's endeavour to throw some light on these disputed questions by taking such a survey of the areas as would possibly contribute to at any rate a clearer understanding of the points which have been urged in the above-mentioned commentaries. It will be seen, then, that the work which has been done by the Society's student is a contribution towards the solution of a much more important question than is involved in the determining of the position of a body of men on a certain battlefield, or the location of the site of a possibly unimportant building. These minor questions may interest the specialist student of ancient history, but the major question involving the credibility of Herodotus and Thucydides must appeal to the interest of any one who has studied ancient history at all. Mr. Grundy has studied the classical narratives among the actual scenes in which the events narrated are represented as having taken place, and his monographs will aim at a statement of the impressions which he has formed in consequence of such study, while the accurate and minutely detailed surveys which he has made will give critics for the first time the advantage of an adequate knowledge of local facts on which to form their opinions.

The Torrents of Switzerland.—Our honorary corresponding member, Professor Paul Chaux, of Geneva, in sending the volume to which he refers, writes as follows:—"I have in a former paper given an abridged account of the general measures adopted to prevent or remedy the floods to which Switzerland is liable by constructing weirs on a certain plan at the head of some of the mountain streams. The engineer, M. Ad. de Salis, lately deceased, left a second report ready for press, describing some new works executed in ten different parts of the country. It has now been published, illustrated by twelve maps, twenty-one photograph

views, very finely reproduced, and thirty-three plates. The most important of these works is the controlling of the Nolla, a small stream but peculiarly dangerous on account of the floods it has occasioned in a large part of the Canton of Grisons. The Schwarz Nolla, so called on account of its turbid waters, enters the bed of the Hinterrhein by its left bank, opposite the venerable ruins of the castle of Hohenrhätien, and above the borough of Thusis. The Schwarz Nolla, falling from a height of 6056 feet above the level of the sea to that of 3696 feet in a distance of 2 miles within a narrow chasm lined with very steep crumbling sides, carried, when swollen by unusually heavy rains, formidable volumes of mud which stopped the course of the Rhine, and for days together subjected the whole country to disastrous floods. These inundations are recorded as serious in chronicles of the year 1585, and were repeated in 1705, 1706, 1707, 1710, 1711, and 1719. An inundation in 1807 led to the interference of the renowned Escher, the engineer of the Linth. The year 1808 was the occasion of a succession of repeated disasters, which it required energetic steps to resist; and they, like the others, originated with the filling up and sudden discharge of the chasm of the Schwarz Nolla. All the tributary rills which run on the left slopes of its course were stopped above the chasm, diverted into an artificial canal, the slope of which was regulated by a succession of twenty-seven weirs, and restored at a lower level to their original course, so clear and free from mud as to prove completely harmless when the extraordinary rains of the year 1890 poured disastrous floods over the Austrian territory on the right bank of the Rhine. The precise nature of the works executed on each of the streams, with large-scale plans and sections, is described in the memoir."

The New Survey of France.—A paper read to the French Topographical Society by M. Ch. Lallemand, the Chief of the Levelling Service, and published in the *Revue de Géographie*, for January and February, gives a masterly summary of the methods and results of the great work which has just been completed. The levelling was of a very high order of precision, and the accumulated error between Marseilles and Lille could not exceed 2 inches. The mean level of the sea was obtained, by the use of specially constructed recording tide-gauges, at more than forty stations on the Channel, the Bay of Biscay, and the Mediterranean. The result of these determinations, connected by the land levels, showed that there was no appreciable difference in the mean level of the sea on the three coasts of France, the greatest observed differences being only a few centimetres. Suitable bench-marks are now being put in position all over the country, and a complete index of these, specifying the exact elevation, will shortly be published.

Local Geography in France.—The extent to which local geographical study is organised and encouraged in France contrasts curiously with

the almost exclusive interest in foreign countries which sums up all geography in the average British mind. *La Geographie* publishes a syllabus of the Geographical Section of the Congress of Learned Societies which opens in the Sorbonne on April 4th, and it may be of service to the much-neglected local geography of the United Kingdom if we summarise its main features. These are: To report the existence of the more interesting geographical manuscripts and maps preserved in the various public libraries or private collections in France, and to catalogue early local maps; to determine the boundaries of one or more of the old provinces of 1789, to give biographies of early French explorers, and their work previous to 1789; to trace the actual distribution of dwellings in France, *e.g.*, the mode of grouping into farms, hamlets, villages, towns, etc., in different parts of the country with the greatest altitude at which houses are permanently occupied, and similar studies for earlier periods. Research into the limits of the most characteristic ethnic suffixes in place-names illustrated by maps; the study of the boundaries of the old local divisions such as Brie, Beauce, Morvan, Sologne, as shown by the customs, dialects, and characteristics of the people, and the physical causes which have determined these divisions; the recovery of popular names for natural features which are not preserved on official maps. It is intended also to study the past and present changes in the coast-line caused by erosion, sand-drift, etc., to seek for evidence of movements of the land in inland places within historic time or in human memory, and to give a detailed account of all traceable physical changes carried back to the earliest times for some one region; to investigate the traces of the earliest peoples in France, especially in Brittany, and to study colonial geography. Such a programme is, we fear, too ambitious to be successfully fulfilled; but many entries in our monthly record of geographical literature show how effectively the geography—as distinguished from the topography—of small districts is now being studied by the French.

The Basin of Arcachon, Gironde.—M. J. Thoulet gives, in the *Comptes Rendus*, a note on this basin—a large depression communicating with the ocean only by a narrow channel, and separated elsewhere by sand-dunes. This is the chief centre in France for the culture of oysters. Its bed (mostly covered at high water) is traversed by channels of various depths, due to the violent currents, which play an important part in moulding its features. These vary in speed and direction, according to the state of the tide and the variable amounts of water which enter or leave the basin in equal times. The sand-dunes fringing its shores are much subject to erosion, which is most active where the currents impinge on a concave shore, especially when this is the case both at the flood and ebb. The basin is being rapidly filled with sediment; and unless recourse is had to dredging—a *desideratum* both for the sake of the oyster-beds and the improvement of the neigh-

bouring lands for agriculture—it is likely to share the fate of the other basins of the Landes, now shut off from the sea, whose mode of origin is elucidated by a study of that of Arcachon. In the sand-dunes five superposed beds of soil are to be traced, containing trunks of trees *in situ* and other remains of vegetation.

ASIA.

The Trans-Caspian Province.—A correspondent in Askhabad points out that in the statistics of the Trans-Caspian Territory in the *Proceedings* for 1892, p. 858, the number of strangers in 1890 should be 19,227 instead of 9227 as there given. He also sends some interesting statistics for the year 1891. The total population in that year was 276,709, of whom 210,518 were Turkomans and 44,404 Kirghiz, a total of 254,922 indigenous people (62,008 kikitkas), and 21,787 strangers, of whom 6762 were Russians (troops excluded). During 1891 the sources of the Ghermal River have been cleared out and the water led into artificial canals. The daily supply of water is thus increased by 100,000,000 gallons, and it has been possible without detracting from the value of existing Russian and Turkoman villages, to found two new settlements—Skobelevski and Kulkulab. The irrigation of the Merv, Tolstan, and Penjdeh oases has been greatly improved, and new military cantonments for the protection of Russian colonists have been founded on the Kushk River in the neighbourhood of Kota Tepe, and joined by telegraph and carriage-roads to Merv and Sarakhs.

Mr. E. H. Parker's Report on Annam.—Consul Parker in his recent report on Annam gives some useful notes regarding the present condition of the country. The north and south "dominions" of Annam are the real present centres of wealth and population, whilst Annam proper is described as a mere strip, like Chile, wedged in between the mountains and the sea, with a population of about four or five millions. Tonkin, the ancient seat of the Annamese race, has a population of from fifteen to twenty millions. The combined population of Cambodia and French Cochin China apparently does not exceed that of Annam proper. French Cochin China is that part of Cambodia conquered by Annam in 1699, and colonised with Chinese and Annamese. Whilst at Turane, the great trading port of Annam, an opportunity was afforded Consul Parker of visiting the coal mines at Nong-sin, situated in the mountains which practically form a western boundary for all Annam, and lying about 40 miles to the south-west of Turane. The concession now being worked is about 4 square miles in area, inclosed on three sides by mountains, and on one by the river. The coal, of which there appears to be abundance, is chiefly anthracite. On the way to the coal-mines, Consul Parker visited the citadel of Kwang-nam and the ancient mart of Faifo. Kwang-nam, we are told, is the capital of the province of the same name, which with the province

of Kwang-ngai, forms the residency of Nam-ngai. The citadel is described as a square enclosure, about a mile in circumference, surrounded by a moat, and guarded at each corner by a bastion; though smaller, it apparently differs little in general style from the citadels of Hué and Hanoi. Faifo, although a great trading centre in the sixteenth century, is now described as being a mere link or *dépôt* for the transit of inland goods from the semi-civilised regions. Its chief exports are sugar, silk, cinnamon, and edible birds'-nests. Consul Parker is of opinion that under a watchful customs administration, the trade of Annam would be capable of great development.

Survey of the River Sebung (Annam).—An excellent piece of survey work was accomplished last year by Dr. A. Yersin, in the course of a journey from the coast of Annam to the Mekong, across a hitherto unknown tract of country. Dr. Yersin is an official of the "Compagnie des Messageries Maritimes," and the general plan of his journey, which was made during a short leave of absence, was suggested to him by Captain Cupel. The principal object was to discover the source of the Sebung, one of the great affluents of the Mekong, and, if possible, the headwaters of the Don Nai. The first part of the programme only could, from lack of time, be carried out, as the basins of the Sebung and the Don Nai are separated by a high range of mountains, which can only be crossed during the dry season, and the traveller was too late (June). The country traversed is inhabited by numerous savage peoples (the Mois, the Benongs, etc.) who have no relations with the Annamites, and had never seen or heard of Europeans. They are extremely warlike, and have no central government, each village forming a little independent republic, always at war with its neighbours. Dr. Yersin travelled alone, with two Annamite boys, and was well received everywhere. The country is a plateau, rising to about 1500 feet above the sea-level, and cut by numerous water-courses. It is covered by an immense forest, extending from the coast of Annam to the Mekong. This forest contains in some parts gigantic trees, on which many varieties of orchids flourish, and is peopled by animals of every description, *e.g.*, elephants, rhinoceroses, wild buffaloes, tigers, deer, bears, boars, monkeys. In certain districts the population is very dense, a village of from one hundred to four hundred inhabitants occurring every 8 miles; in other parts the country is absolutely desert. Sometimes the traveller marched for seven whole days without coming across a single habitation. The geographical co-ordinates of all the villages were taken by means of a theodolite, and it has thus been possible to prepare an accurate map of the region, showing the whole course of the river Sebung, from its source to its confluence with the Mekong. This map, with a brief *résumé* of the expedition, appears in Nos. 15 and 16 of the *Comptes Rendus* of the Paris Geographical Society; the detailed report will be published in the work of M. Pavie, on the operations of his mission in Indo-China.

Meteorology of the Pamirs.—The *Bulletin* of the Paris Geographical Society (1892, p. 316) contains notes by M. Capus on the climate of the Pamirs. Summer in that region, or the period in which no frosts occur, occupies two, or at most three, weeks in July. Spring and autumn last each slightly over two months, and winter prevails for the remaining seven. M. Capus's observations were taken in March and April, 1887. A remarkable fact is the non-persistence of very low temperatures even in winter. The variations between day and night, sun and shade, are excessive, and the rise and fall of the thermometer very rapid. Although by night, especially if calm and cloudless, the freezing-point of mercury will often be reached, between midday and one p.m. the temperature will be above 32° Fahr., being higher with a cloudy sky. In spring southwest winds prevail, blowing from the plains up the main valleys, following their trend. Another noteworthy point is the uneven distribution of snow, which depends on the degree of exposure to wind, aspect of slopes, altitude, soil, &c. The Pamirs proper have a much slighter snow-covering than the Alai, the wind having deposited most of the moisture on the bounding ranges. Many parts are bare even in winter, and afford scanty pasturage. The considerable amount of radiant heat absorbed by dark soils contributes to the quick melting of the snow. Glaciers now hardly exist, and the drainage is much less than formerly, probably owing to the desiccation of the Central Asian depressions.

Present Condition of Bussorah.—Major Jennings, in a recent consular report, gives an account of the present condition of Bussorah. This town is situated on the right bank of the Shat-ul-Arab, some 60 miles from its mouth at Fao, at the head of the Persian Gulf. There is deep water between Bussorah and the latter place, excepting a slight bar at Muhammarah (18 miles below Bussorah). The second bar is situated a couple of miles from the mouth of the river, on the right bank, and 2½ miles east-south-east of Fao Fort. The depth of the water on the bars is much influenced by local conditions, being greater with a southerly wind. The exports of Bussorah include dates, wool, and horses, the majority of the latter coming from the Montefik and Amarah country, while, as a rule, the more valuable horses come from Mosul and Najd. Agriculture has apparently not developed much of late years in the immediate vicinity of Bussorah, owing to the fact that almost all available and suitable land is being devoted to the cultivation of the date-palm. Referring to the climate of Bussorah, Major Jennings says: "It is true that a remarkable improvement has taken place in the neighbourhood, owing to the substitution of date and wheat cultivation for that of rice, the result being that the river banks are all along now 'bunded' to keep out the water, except that necessary for irrigation purposes, and the

country inland is hence much drier than heretofore. But malarial fever has by no means vanished." Of late years Bussorah has become a large grain-exporting port; and the exports of cereals (wheat, barley, rice, &c.) during the past year (1891) have far exceeded in amount those of any previous year.

The Coal-Measures of Sakhalin.—It appears from the explorations which were made in 1891 by the mining engineer, M. Sukhanovich, in Aniva Bay, on the east coast of the Island of Sakhalin, in the neighbourhood of Korsakoff Station, that the best beds of coal in these regions are found about Selutor Station and on the River Nai. Two beds of coal, the maximum thickness of which is respectively 9 and 23 feet, and accompanied by two thinner beds, were found around Selutor Station. The coal is embedded in soft clay, shale, and sandstone. Iron ore has been found in many places, but only in lumps scattered within the rocks.

AFRICA.

Mr. Chanler's Expedition in East Africa.*—Mr. Chanler left Mkonumbi on the coast of Witu on September 18th with a caravan numbering 185 men, 15 camels, 43 donkeys, 2 horses, 10 oxen, and 10 goats, and reached Hameya (or rather Balarti, the I. B. E. A. Co.'s station) on November 26th, with a loss of 20 men and 5 camels. He marched in a leisurely manner, following the left bank of the Tana from Merifano to Subaki, where he crossed over to the right bank. A small flotilla of twelve canoes carried food and some of the loads. An ordinary trading caravan might do the distance in five weeks. He found the Tana route a capital one for caravans. There is plenty of food from Engatana on, and there is no difficulty in procuring water if one takes native guides. The Wapokomo dreaded the approach of Europeans, but Mr. Chanler did his best to remove the bad impression former travellers have left behind them, and succeeded in establishing friendly relations. At Tunj he succeeded in driving off a party of Somalis, who were ravaging the neighbourhood. The Gallas of Korokoro were found to be in a very weak state, having been attacked three times this year by the Wakamba. The Company's station was found to be in good repair. Careful search was made for the "Galla" and "Friedrich Franz Mountains" of Dr. Peters; but they could not be found. Mr. Chanler proposes to march with Lieutenant von Höhnel and seventy-five men to the Mackenzie River, to follow that river up to its source, and to go in search of the Lorian Lake. He expects to return to his depot at the Company's station in about a couple of months. Lieutenant von Höhnel's map of

* Communicated by the Imperial British East Africa Company.

the Tana agrees with those of Mr. Denhard and Captain Dundas, as to details,* but shifts the whole of the river from 18 to 28 miles to the east. The principal points determined astronomically by Lieutenant von Höhnelt are the following—

	Lat. S.			Long. E.		
	°	'	"	°	'	"
Mkonumbi	2	18	40	40	43	50
Witu Camp	2	26	40	40	30	52
Merifano	2	16	15	40	15	30
Engatana Camp	2	13	31	40	19	0
Mwina Camp	2	3	40	40	21	40
Kinakombe Camp	1	45	23	40	18	30
Massa Village	1	12	13	40	11	53
Tuni Camp	1	4	35	40	10	0
Company's Station (Balarti)	0	7	23	39	25	0

The Sabi River.—Mr. A. Vaughan Williams writes from Chiloane, October 3rd, 1892, that he has ascended the Sabi River to the furthest point where the tide is felt, or about 30 miles from its mouth. He entered by the northern or Makau branch of the Sabi, which has a bar with 5 feet of water at low tide, and is about half a mile wide. Spikuku's people, whose Zimbabwe he visited, speak the same language as the Banyai. They have fought valiantly against the invading Zulu, and the jungle, in which they occasionally sought a refuge, is strewn with human skeletons. The indiarubber plant abounds in this jungle. There people spin their own cotton and make nets, but they have no looms. Mr. Williams returned to Chiloane by an inland passage, which branches off from the Makau, and is navigable for small boats. He now proposes to make a careful examination of some ruins recently discovered by him on the Buzi.

Zimbabwe Ruins.—We are pleased to observe in the cyclostyled newspaper of Tuli, *The Rhodesia Chronicle and Mashonaland Advertiser*, of December 24th, the following official advertisement:—"Notice is hereby given that the Zimbabwe Ruins and the space within a radius of one mile from the top of the Zimbabwe Hill is preserved by the Government solely for archaeological and scientific purposes, and that no farmers, squatters, or other persons, will be allowed to reside herein; and further that no ploughing or excavating for private purposes will be permitted within such radius. Any person infringing the notice will be regarded as a trespasser, and be liable to prosecution."

Major von Wissmann's Steamer.—In 1890 the Committee of the Anti-Slavery Lottery Fund undertook to transport three steamers to the

* See this map in *Proceedings*, Royal Geographical Society, for August 1892, with notes on it, *ib.* p. 539.

African lakes; the *Peters* to the Victoria Nyanza, the *Wissmann* to Lake Tanganyika, and the *Pfeil* to Lake Nyasa. The public had subscribed £14,400 towards the cost of these steamers, whilst £30,000 were voted by the Fund. The disturbances in Eastern Africa prevented the conveyance of the *Peters* to its destination, and this boat now does duty on the coast. Major von Wissmann's Expedition, consisting of twenty-three Europeans and two hundred and thirty natives, arrived at the Chinde mouth of the Zambezi about the middle of June, together with the steamers, three steel boats, and four barges. The first detachment of the expedition started on July 14th. The difficulties of transport, however, proved so formidable that the original plan has been given up. The *Pfeil*, a screw-steamer 52 feet in length, is to return to the coast, whilst the *Wissmann* is to be put together at Mpimbe on the Upper Shire, and will do duty on Lake Nyasa. The *Wissmann* is a steel boat constructed in six compartments. Her total length is 85 feet, she has a draught of about 6 feet, and engines of 120 horse-power.

Lagos.—The Governor of Lagos, accompanied by his staff, which includes Dr. Rowland as medical officer and botanist, and Mr. A. G. Fowler, whose services have been secured for the purpose of surveying and fixing positions by astronomical observations, left Lagos for the interior on January 3rd, 1893. As this part of Africa is very imperfectly mapped, it is hoped that good results may be obtained, especially as the party includes men quite capable of doing excellent work.

NORTH AMERICA.

Boundaries of Canada and the United States.—The text of a convention between Great Britain and the United States has just been published (Treaty Series, No. 16, 1892), which provides for a new survey of the frontier between Canada and Alaska, from its southern extremity in 54° 40' N., to the point where the boundary meets the 141st meridian of west longitude, the line of demarcation between Canada and peninsula Alaska. The work is to be a coincident or joint survey, as circumstances may decide, and the Commissions of both Governments will meet at Ottawa as soon as the necessary supplies are granted. The survey will serve as the basis for definitely settling the boundary. Another Commission is to be appointed to decide on a method of more accurately marking, by buoys or otherwise, the boundary-line between the two countries in Passamaquoddy Bay, which separates the coast of Maine from that of New Brunswick.

Climate of Death Valley, California.—A recent bulletin of the American Weather Bureau contains some notes on the climate of Death Valley, California, which are of interest as describing the most perfect development hitherto met with of the climatic conditions peculiar to valleys. Death Valley lies on the northern

margin of the Mohave Desert, between the Panamint Mountains on the west side, and the Funeral and Amargosa Ranges on the east. The former attains a height of 8000 or 9000 feet; and the latter of about 5000 feet. Its length is about 75 miles; breadth, 20 to 25 miles from crest to crest; and about half as much across the bottom at its widest part. At the observing station the breadth was 6 miles. The valley runs nearly north-north-west to south-south-east, and has generally been supposed to extend some few feet below sea-level, although the more recent barometric observations do not support this conclusion. The valley proper is probably the bed of a former lake of bitter water. A thin crust of salt runs along the east side, and in the bottom there is a salt marsh, destitute of vegetation, and bordered by slopes sparsely covered with shrubs and cacti. Another salt marsh, covered with tall coarse grass, occurs at the northern end. The sand is bare and white, shifting easily. The surroundings are evidently such as to isolate a large body of air in the valley and to expose it to excessive radiation. Meteorological observations were begun on April 30th, 1891, and continued till the end of September. The 5.13 A.M. and 5.13 P.M. observations of temperature give the following monthly means: May, $84^{\circ}\cdot7$; June, $92^{\circ}\cdot1$; July, $102^{\circ}\cdot1$; August, $100^{\circ}\cdot8$; September, $90^{\circ}\cdot2$; the highest temperature observed was 122° , and the lowest, 54° ; average daily range, $23^{\circ}\cdot6$. The records show a hot spell from July 18th to 24th, when the daily mean did not fall below $106^{\circ}\cdot4$, and averaged $107^{\circ}\cdot5$. The amount of moisture is remarkably constant throughout, averaging 3.56 grains per cubic foot. The highest relative humidity observed was 75 per cent., and the lowest, 5 per cent.; average at morning observations, 30.5; evening, 15.6. Hence it appears that temperature was never less than 9° above the dew point, while for the most part the dryness was intense. These facts gain much significance from a study of the wind observations, which show a strong preponderance of up-valley winds (south and south-east), and these are not only the most frequent but markedly hottest and strongest. The south winds occur more than twice as frequently in the evening than in the morning, and the north winds less than half as frequently. On the whole, the frequency of up-valley winds is to that of down-valley as 5 to 1, which suggests that the valley, running north and south, tends to accentuate the monsoon influence which has already been recognised in South-eastern California. Of rainfall thirteen showers gave 1.40 inch, and nine left only a trace. Out of fifty hours of rain only fifteen occurred during the day, and the rain was wholly local in character. The chief interest of the pressure observations centres in the diurnal curve deduced from the apparently trustworthy records of a Richard barograph. The curve has a single maximum and minimum at 8 A.M. and 5 P.M., and a diurnal range of 0.082 inch, the most marked specimen of the valley type yet obtained. It is remarkable that the pressure variations give little or no clue to changes of weather, of which the outstanding features are gales, hot blasts, rain, and sand storms.

SOUTH AMERICA.

Brazilian Guiana.—A general description of the prairies (*Campos gaeas*), oasis of *Mauritia rinifera* (*Buritisaes*), and forests of the large region called Brazilian Guiana, south of Venezuela and the Guianas, north of the Rivers Negro and Amazons, was published (1891, p. 276) by Senhor Gustavo da Suckow in the *Revista* of the Geographical Society of Rio de Janeiro. The centre of this country is the Rio Branco, an affluent of the Rio Negro. The *campos* extend from $1^{\circ} 40'$ N. lat. to

the Pakaraima and Kwimirapaka Mountains, where, at Santa Maria, Carmo, and Pesqueiro Real, remains of old Portuguese settlements are still to be seen. The fertility of the *campos*, which are there at a very short distance from British Guiana, and their capabilities for raising coffee, cotton, sugar-cane, tobacco and cereals, are extraordinary. The few white settlers in the country have already more than 20,000 head of cattle and 3000 horses. Gold is very abundant. An old legend says that the bottom of Lake Amacu, in the Pirarára *campos*, is entirely lined with gold. Some of the Indian tribes—Makushi, Mapishanas, Paushianas, Yuricunas, Porokotis—are more or less domesticated. The only wild Indians are the Masahys. Not far away in River Rupunuri (British Guiana) there are English missionaries. Senhor Snokow's paper includes the experience of Senhor Jose Paulino von Hoonholtz during three years' residence in those regions.

Explorations in the Beni Province.—Baron H. Arnous de Rivière contributes to the *Bulletin* of the American Geographical Society some notes on his journeys in this province in 1886. His interest having been aroused by accounts of the gold-bearing streams of the eastern slope of the Andes, he determined to explore the abandoned diggings and the best routes to them across the snowy range, which here culminates in the great peaks of Sorata (or Illampu), Huama-Potosí, and Illimani. By tracing the course of the streams with compass and chain a fairly accurate map was produced, and the conclusion arrived at that a road could be easily made, and at a comparatively small cost. It would have, however, to be cut through the forest, following the river's course as nearly as possible, none of the existing paths being capable of utilisation. Of these there are four, details of which are given. Some are badly traced; while the fact that part of the way is done by water makes the journey in one direction perilous and slow. That which is at present in the worst condition takes, however, the best direction (along the Challana Valley); and it is this line which Baron de Rivière recommends as the best for connecting the Beni with La Paz. The latter town will eventually be connected with the Pacific by three railways; but for the present the shortest route to the Beni is by the Arequipa Railway to L. Titicaca, and thence *via* Huaichu, on its eastern shore, to the Mapiri River. This route avoids the perilous passage of the Andes at Sorata. In conclusion, the Baron deals with the natural resources of the Beni, and shows that the ideas of its unhealthiness are somewhat exaggerated.

Exploration of Venezuela.—The *Revue Française* states that Dr. Sievers of Giessen has received a grant of £400 from the Hamburg Geographical Society for explorations in the llanos of the Orinoko.

AUSTRALASIA AND PACIFIC ISLANDS.

Sir William Macgregor and the Islands South-East of New Guinea.—In a former despatch Sir William Macgregor supplied some notes regarding the little-known Kiriwina or Trobriand group of islands lying to the north of the D'Entrecasteaux group.* In the present despatch he gives the position of the north and south points of the principal island. His observations at Giriba, at the south end, gave a latitude of $8^{\circ} 48' 17''$ S., while those at Bomatu, the Cap Denis of D'Entrecasteaux, at the north end, gave the latitude of that place as $8^{\circ} 24' 15''$ S. The length of Kiriwina Island is therefore 24 geographical miles. Sir William draws particular attention to the fact that these positions as determined by D'Entrecasteaux correspond exactly in one case, and within 1' in another with his own. The country between Kaibola and Bomatu at the northern end of Kiriwina, and also the neighbouring island of Vakuta is composed of coral, is mostly flat and of extraordinary fertility. An inspection was also made of the coast between Wedan and Radawa on the north-east coast of the possession. Between these places there are stated to be no coast villages. A line of mountains apparently about 4000 feet high, runs parallel to the coast, their spurs in many places projecting into the sea. They seem to consist of basalt, but with many horizontal outcrops of coral limestone as far up the coast as Radawa. The population, mainly owing to the steepness of the land and the resulting rain-wash, have had to withdraw up the mountains as the soil below disappeared, and now appear to live at a height of 1500 to 2000 feet, on the lower margin of the forest that crowns the mountain-tops. At several places along the coast there are grassy plateaux at different elevations, apparently old sea margins. Two of the largest of these are situated at the head of Rabua (Goodenough Bay) on the south side. There appears to be a very considerable population along the north-east side of the bay distributed in small villages, which also extend inland. During the present visit, Sir William fixed the latitude of Dobu Station as, $9^{\circ} 45' 00''$ S., and of the island of Tuwikike (with Tuwai, the Mosquito Islands of the chart) as, $9^{\circ} 47' 23''$ S.

Changes in Kilauea.—On the occasion of an ascent of the summit of Kilauea (4250 feet) on the island of Hawaii, for the purpose of inspecting the lava lake there, Dr. Marcuse was able to make some important observations and measurements with regard to the upheavals and subsidences of the hot and cold lava masses, and he described his results in a paper to the December meeting of the Berlin Geographical Society. The map issued by the well-directed Hawaiian Land Survey of 1886 can scarcely be recognised again, in consequence of the immense changes which have taken place in the meanwhile in this active volcano. According to the data given, the edge of the crater has, within the last five years, been raised about 70 feet above the liquid lava.

* *Vide Proceedings*, 1892, pp. 327, 328.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Relations of Soil to Climate.—Under the above title the United States Weather Bureau (Department of Agriculture) publishes a suggestive report by Prof. E. W. Hilgard, of the University of California in which an attempt is made to draw some several distinctions between the soils of arid and humid climates. The author discusses the mechanical and chemical effects of different temperatures and amounts of rainfall upon soils derived from different formations, whether these remain in position or have been removed from the parent rock by glacial or other agencies. The influence of temperature is chiefly recognised by increased chemical activity in warm climates, and increased mechanical activity in continental climates where the range is great, and there is frequent freezing and thawing. The characteristic difference between the soils of humid and arid climates, so far as physical condition is concerned, is the extreme lightness or "dustiness" of the latter, and the similarity of the surface and subsoils. In the absence of sufficient rainfall little clay is formed, and that little is not washed down into a subsoil. Again, the formation of humus by the decay of vegetable matter goes on very slowly in arid regions, and the result leaves little residue beyond mineral ash, very different from the true black humus formed by decay underground in well-drained land, and the antithesis of the "sour" acid humus of peat-bogs. The greater part of the paper deals with the chemical action of rainfall by "leaching." Analyses of soils from nine "humid" and three "arid" States, excluding those in direct connection with calcareous formations, are compared. Evidence is adduced to show that in general carbonate of lime accumulates in arid regions, while in humid climates it is washed into the subsoils or into valleys; and, further, that climatic influences deal similarly with the agriculturally-less important carbonate of magnesia. It is then shown that the "insoluble residue" or sand with the lime is insufficient to account for all the soil ingredients, and that therefore the leaching process must extend further, to the formation of clay from feldspathic minerals and, simultaneously, of complex hydrous silicates or zeolites. In these last potash is always retained more tenaciously than soda, and the latter only accumulates where the rainfall is exceedingly scanty as in the alkali lands of the arid regions.

CORRESPONDENCE.

The Ruins in Mashonaland.

15, WALMER CRESCENT, GLASGOW.
Feb. 11th, 1893.

SIR,—What Dr. Schlichter says in his criticism of the "Ruined Cities of Mashonaland," regarding my contribution to that book, hardly seems to me satisfactory. He remarks, that what I have written does not strike him as furnishing the true key to the plans of the ruins; but he does not suggest any other solution, nor does he show that my key fails to apply to any of the features of the ruins. Besides, I do not base my statement regarding the bearing of the rising sun at the summer solstice, nor of the observation of meridian transits of stars, on the existence of the altar in the Great Temple—which I have described in the text as merely supposititious; but on the position of the centre of the arc $\Lambda \kappa$. And I have shown that a point is always marked true north of the centre of every known arc in every

temple in Masbonaland. It is on this constant marking out of the meridian that I have based my statement regarding the observation of meridian transits.

I do not think that the position of the patterns on the outside of the temples was fixed on mathematical considerations, although the ends of the chevron pattern on the Great Temple happen to coincide with the points where the arcs change their radii, but I think that the purpose of this pattern was simply to decorate the part of the wall which faced the sun when rising at midsummer.

Regarding the orientation of the Great Temple, I would like to remark that, if the straight line through the centres of the arcs π κ , Λ κ^* , and the great tower be continued, it will cut the outer line of the wall at its base, midway between π and κ , which point let us call π . The distance from the centre of the great tower to π is equal to the semi-circumference of that tower; and the distance from π to the centre of the little tower is equal to twice its circumference; while the distance between the centres of the towers is equal to the diameter of the one, or the circumference of the other. Now, the line through π and the centre of the great tower, is the main axis of the temple, and the line from the same point through the centre of the little tower seems to be a true meridian line, and agrees very closely with the direction of the meridian observed with prismatic compass; in fact, if we apply the small correction necessary to make our observed meridian coincide with this, then the meridian line, from the centre of the arc Λ κ (the altar (?)), through the main doorway, will pass through its centre, and will not lie against its eastern side, as it does in the plans. All this is not, however, readily apparent on the plans which have been published, for they are on much too small a scale. Admitting this method of orientation by the towers, the bearing of κ from the altar (?) will be E. $23^\circ 53' 10''$ S.

The accuracy of the orientation of the Great Temple gives us a measure of the accuracy of the work of its builders, and corresponds with the accurate mathematical construction of the ground plans of the temples. Although, unfortunately, when at Zimbabwe, we attached no importance to orientation, yet our observations (which have been confirmed by an independent observation, kindly taken by Sir John Willoughby) are sufficient to show that the bearing of the great stone on the hill from the doorway of the Great Temple, is true north to within $15'$ of error, or even less; and I shall not be surprised if it is shown that the error is less than $5'$.

With regard to Dr. Schlichter's criticism of Mr. Bent's historico-geographical remarks, and in my friend's absence from England, I would like to say that when Dr. Schlichter admits that the temples could not possibly have been built by African savages, and when he says that the principal authorities describe the territories south of the Zanzibar coast as almost entirely unexplored, he is hardly justified in disagreeing with Mr. Bent's statement that these authorities had no practical knowledge of the subject in hand.

I agree with Carl Ritter's remark, that these ruins will become the link for comparing ancient and modern geography; and I hope that we shall soon link them with some ruins of a better known civilisation.

Yours faithfully,

ROBERT M. W. SWAN.

The Editor of *The Geographical Journal*.

* See plan of the Great Temple in the 'Ruined Cities of Masbonaland.' In the plan printed in the *Proceedings* of the Royal Geographical Society for May, 1892, κ will be at the point where the solstitial line from the altar cuts the outer line of the wall about midway between Λ and π , and the centre of the arc π κ will lie on a continuation of the straight line from the centre of the great tower through the altar and 70 feet distant from the altar.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1892-93.

Sixth Ordinary Meeting, January 30th, 1893.—The Right Hon. Sir
MOUNTSTUART E. GRANT DUFF, G.C.S.I., President, in the Chair.

ELECTIONS.—*John Walwork Ashworth; Francis Pratt Barlow; Charles Caldwell Dallas; Thomas Alfred Greer, M.D.; Charles Grimes; Charles Forbes Harford-Battersby, M.A., M.D.; Frank Brinsley Harper; Maj.-General Adam G. Forbes Hogg, C.B. (Indian Staff Corps); Colonel Roland Bertram Lane; Hon.-James Wilberforce Longley; Alfred Owen Lyon, B.A.; Arthur William Meers; Ernest George Meers; Robert Trail Omond; James Shand; Henry Eugene Wale; Charles Osborne West; William Lloyd Wise, J.P.*

The papers read were:—

1. "Journeys Round the Island of Yezo, and into the Interior." By A. H. Savage Landor.

2. "Journey Across the Island of Yezo." By Prof. J. Milne, F.R.S.

There was an exhibition of photographs, maps, etc., in the tea-room.

Seventh Ordinary Meeting, February 13th, 1893.—The Right Hon. Sir
MOUNTSTUART E. GRANT DUFF, G.C.S.I., President, in the Chair.

ELECTIONS.—*Charles H. J. Acrob; William James Armitage; Frederick B. Ashton; Ralph Brocklebank; Archibald Campbell (Scots Guards); Lord Carew; William Clauson-Thue; Arthur Sidney Graves; Gilbert Edward Hatfield; Dr. Julius Klein, M.A.; Colonel Alfred Thomas Mander, R.E.; Albert Davidson Michael; Mrs. Elizabeth Prentiss Mortimer; Arthur Octavius Prickard, M.A.; Dr. Hugh Rayner; Frederick Henry Read Sawyer; Henry Stephen; Seymour Vandeleur (Scots Guards); Herbert Ward.*

The paper read was:—

"Twenty Years' Travel in South Central Africa." By F. C. Selous.

There was an exhibition of zoological specimens, photographs, etc.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

EUROPE.

Austria—Carinthia. *Zeit. Ges. Erdkunde Berlin* 27 (1892): 349-396. **Frech.**
Die Gebirgsformen im südwestlichen Kärnten und ihre Entstehung.
Von Dr. Fritz Frech (Mit einer Kartenskizze, sieben Tafeln und einer
Textabbildung).

A study of the causes which led to the present configuration of the Carinthian mountains and lakes.

Belgium—Campine. *Bul. Soc. Roy. Belge Geog.* 16 (1892): 516-544, 613-642. **Harou.**
Une Excursion en Campine. Par Alfred Harou.

Continuation of an exhaustive account of the Campine considered in all its aspects and classified with a high degree of sub-division. History predominates.

- Belgium—Scheldt.** *Bul. Soc. Roy. Belge Geog.* 16 (1892): 453, 587-611. **Van Werveke.**
Etude sur le cours de l'Escaut et de la Lys-Durme au moyen age. Par
 A. K. Van Werveke.

A laborious study, with several maps, of the changes which have taken place during historic times in the hydrography of the Scheldt and Lys.

Corsica.

Barry.

Studies in Corsica, sylvan and social. By John Warren Barry, M.A.
 London, Sampson Low, Marston & Co., 1893: 8vo, pp. xvi. and 302.
Map and illustrations. Presented by the Publishers.

A leisurely account of leisurely wanderings through Corsica, with special regard to the distribution of forest trees in the island. Many of the facts of distribution, although not systematically treated, are of value, and the chapters on social life make the book a delightful one for those thinking over former tours to Corsica, or contemplating a visit. Mr. Barry writes with knowledge of his special subject.

Danube.

Gonda.

La Regularisation des Portes de Fer et des autres cataractes du bas Danube. Rapport par M. Bela de Gonda. Paris, Lahure, 1892: large 8vo, pp. 80. *Plates and illustrations.*

A paper read to the Fifth International Congress of Inland Navigation held at Paris in 1892. It is specially noticed in the *Journal*, p. 237.

France—Brittany.

Ann. Geog. 2 (1893): 173-188.

Gallouédec.

Etudes sur la Basse-Bretagne. Le Pays de Léon. Par L. Gallouédec.

The pays de Léon is described with maps. It is the smallest division of Lower Brittany, and is peopled by the least altered Bretons.

France—La Crau.

Ann. Geog. 2 (1893): 189-211.

Rainaud.

La Crau. Par A. Rainaud.

A study, with large-scale map, of the pebbly plain of La Crau, lying between the western branch of the Rhone delta and the Etang de Berre.

France—Marseilles.

Bul. Soc. Geog. Marseille 17 (1893): 5-10.

Roux.

L'Etang de Berre. Par J. Charles Roux.

A proposal to convert the deep lagoon, known as the Etang de Berre, a few miles west of Marseilles, into a harbour, by dredging and improving the channel.

France—The Seine.

Babinet.

Resumé des observations centralisées par la Service Hydrométrique du Bassin de la Seine pendant l'année 1891. Par M. Babinet, Ingénieur des Ponts et Chaussées. Versailles, 1892: large 8vo, pp. 68. *With a series of folio plates.*

A minute report of the rainfall, temperature, and water-level, of the Seine and its tributaries during 1891.

Germany—Alsace and Lorraine.

Gerland.

Geographische Abhandlungen aus den Reichslanden Elsass-Lothringen. Mit Unterstützung der kaiserl. Regierung zu Strassburg, herausgegeben von Prof. Dr. G. Gerland. Erstes Heft. Stuttgart, Koch, 1892: 8vo, pp. 184.

This first part contains two memoirs on the physical geography of the district. Dr. E. Langenbeck discusses the earthquake phenomena of the Upper Rhine Valley and gives a list of recorded earthquakes. Drs. Hergesell, Langenbeck, and Rudolph, treat of the lakes of the South Vosges, describing, with maps, the six existing lakes, Weisser See, Schwarzer See, Sulzerner See, Stern-See, Belchen-See, and Sewen-See, with temperature observations on the first-named. They also describe a large number of former lakes, now dry.

Germany—Elbe.

Mitt. Verein Erdkunde Leipzig (1891): 69-98.

Schreiber.

Die Beziehungen zwischen dem Niederschlag in Böhmen und dem Wasserabfluss in der Elbe bei Tetschen. Von Prof. Dr. P. Schreiber in Chemnitz. *With two plates.*

The relation between the rainfall in Bohemia and the variations in level of the Elbe at Tetschen are brought out by means of curves for 1888, 1889, and part of 1890.

Turkey—Constantinople.**Elliott.**

Diary of an Idle Woman in Constantinople. By Frances Elliott. With map and illustrations. London, John Murray, 1893: 8vo, pp. [12] and 426. Price 14s. Presented by the Publisher.

An excellent picture of modern Constantinople, with brief dramatic summaries of the historical associations which invest the neglected sites of former greatness. The last chapter, dealing with the Bosphorus, is one of the best, showing the author's power of word-painting in great perfection. There is no hint of idleness either with regard to sight-seeing or historical study.

ASIA.**China.****Schlegel.**

Problèmes Géographiques. Les Peuples Etrangers chez les Historiens Chinois. II. Wen-Chin Kuo, Le Pays des Tatoués. III. Niu Kuo, Le Pays des Femmes. Par Gustave Schlegel. Leide, Brill, 1892: small 4to, pp. 24. Presented by the Author.

China—Pu-to.**Globus 63 (1893): 117-122.****Franks.**

Die heilige Insel Pu-to. Von Dr. O. Franke.

India.**Lyall.**

The Rise of the British Dominion in India. By Sir Alfred Lyall, K.C.B., D.C.L. London, John Murray, 1893: 8vo, pp. xvi and 288, maps. Price 4s. 6d. Presented by the Publisher.

A masterly survey of the recent history of India, written on a scale suitable for its purpose as a University Extension Manual, with due regard to historical perspective. The study stops with the completion of dominion in 1849.

India—Survey.

Synopsis of the result of the operations of The Great Trigonometrical Survey of India. Volume XXV. Descriptions and Co-ordinates of the Principal and Secondary Stations and other fixed points of The South-east Coast Series, or Series of the Southern Trigon. Prepared in the Office of the Trigonometrical Branch, Survey of India, Colonel G. Strahan, R.E., Deputy-Surveyor-General in charge. Published under the orders of Colonel H. R. Thuillier, R.E., Surveyor-General of India. Dehra Dun, 1891: 4to, pp. 114. Two charts. Price 2 rupees.

— Volume XXVI. The Bombay Longitudinal Series, or Series B of the Southern Trigon. Dehra Dun, 1892: 4to, pp. 96. Two charts. Price 2 rupees. Presented by the Secretary of State for India.

Java.**Worsfold.**

A Visit to Java with an Account of the Founding of Singapore. By W. Basil Worsfold. London, Richard Bentley and Son, 1893: 8vo, pp. xii. and 284, illustrations. Presented by the Publishers.

Mr. Worsfold has written an unpretentious and practical guide to some of the sights of Java. It is not a guide-book in the ordinary sense of the term, but rather a book which would serve an intending visitor to the island as an excellent preparation for what he is likely to see and experience. The chapter on the Hindu temples is particularly interesting, and the many passing glimpses of native life are of some value.

Kurdistan.**Bul. Soc. Hongroise Geog. 20 (1892): pp. 48-52.****Butyka.**

Les Kourdes de l'ouest et leur pays dans les contrées situées au nord-ouest de la Turquie-asiatique. Par D. Butyka.

Abstract of a long memoir in Hungarian, pp. 224-251 of the same volume.

Samos.**Stefani and others.**

Samos. Etude Géologique, paléontologique et botanique. Par le professeur Carlo de Stefani, le docteur C. J. Forsyth Major et William Barbey. Avec treize planches par Ch. Ouisin. Lausanne, Bridel & Co. 1891: 4to, pp. 100. Price 16s.

Contains a bibliography of Samos and an account of its botany and geology.

AFRICA

Africa—General.

Keltie.

The Partition of Africa. By J. Scott Keltie, Assistant-Secretary to Royal Geographical Society. London, Stanford, 1893: pp. xvi. and 498. Numerous maps. Price 16s. Presented by the Publisher.

The object of this work is to give a connected history of the events which led to the partition of the greater part of Africa between a few European Powers. The early history of exploration and settlement in Africa is traced and illustrated by means of a series of maps on which the geographical conception of the continent current at different dates is represented in a novel and effective manner. Precise reference to the treaties which define the various spheres of influence make the original sources of all exact information readily available.

African Countries.

Malavialle.

Le Partage politique de l'Afrique en Decembre 1891. Par M. L. Malavialle. 8vo, pp. 116. Presented by the Author.

A reprint from the *Bulletin* of the Languedoc Geographical Society at Montpellier. The development of European possessions in Africa is dealt with historically.

British Protectorates.

Waller.

Heligoland for Zanzibar, or One Island full of Freemen for Two full of Slaves. By Horace Waller. London, Stanford, 1893: 8vo, pp. 52. Price 1s. Presented by the Author.

Egypt—Cairo.

Lane-Poole.

Cairo: sketches of its History, Monuments and Social Life. By Stanley Lane-Poole. With numerous illustrations on wood by G. L. Seymour, Harry Fenn, J. D. Woodward, and others. London, J. S. Virtue & Co., 1892: square 8vo, pp. xvi. and 320. Price 12s. 6d. Presented by the Publishers.

This volume is, the author explains, in large part a collection of previously published writings. The separate essays give distinct glimpses of separate phases of Cairene life, while the many excellent illustrations display the types of people and of architecture. The last chapter deals with the results of the British occupation.

Gambia.

Bul. Soc. Geog. Com. Bordeaux (1893): 1-13.

Rançon.

Dr. Rançon. L'île de MacCarthy (Gambie).

Morocco.

Playfair and Brown.

A Bibliography of Morocco from the Earliest Times to the end of 1891. By Lieut.-Colonel Sir R. Lambert Playfair, K.C.M.G., and Dr. Robert Brown, M.A. Royal Geographical Society Supplementary Papers, Vol. III., Part 3. London, John Murray, 1893: large 8vo, pp. 203-476. Price to non-fellows 5s.

This memoir may be obtained free on application by Fellows of the Society.

Portuguese East Africa.

Smith-Delacour.

A Shironga Vocabulary: or Word Book on the Language of the Natives in the District of Delagon Bay, south-east coast of Africa. Together with a map showing the district. Compiled by E. W. Smith-Delacour, H.B.M. Consul for Lourenço Marquez. London, Harrison & Sons: 1893, 8vo, pp. 32. Presented by the Compiler.

Uganda.

Uganda. By Philo-Africanus. 8vo, pp. 30. Reprinted from *Imperial and Asiatic Quarterly*, January, 1893.

NORTH AMERICA.

Hudson Bay.

Journ. Roy. United Service Inst. 37 (1893): 29-39.

Miller.

An Old Log. By Francis H. Miller.

Account of the voyage of H.M.S.S. *Furnace* and *Discovery* for the purpose of discovering a passage from Hudson Bay to the South Sea in 1741-42.

- Mexico—Tampico.** *Bul. Soc. Geog. Com. Havre* (1892): 370-303. **Voizot.**
Tampico et les travaux du Pañuco. Paul Voizot.
Describes a plan for improving the river-harbour of Tampico.

- United States.** *Science* 21 (1893): 15-17. **Powell.**
The Work of the United States Geological Survey. By J. W. Powell,
Director.

The Geological Survey of the United States includes as a preliminary the topographical survey of the public lands, the arrangements for which are described.

- United States—California.** **Harrington.**
Notes on the Climate and Meteorology of Death Valley, California. By
Mark W. Harrington, Chief of the Weather Bureau. (Bulletin No. 1.
Weather Bureau, United States Department of Agriculture). Washington,
1892: 8vo, pp. 50. *Presented by the United States Weather Bureau.*

- United States—Minerals.** **Day.**
Mineral Resources of the United States. Calendar years 1889 and 1890.
David T. Day, Chief of Division of Mining Statistics and Technology.
(Department of the Interior. United States Geological Survey.)
Washington, 1892: 8vo, pp. viii. and 672. *Presented by the United States
Geological Survey.*

From this useful report we learn that in 1890 the output of pig-iron for the United States exceeded 10 million tons and of coal 141 million tons (the ton of 2000 lbs. is used), the output of iron exceeding that of Great Britain. The statistics are well arranged for ready reference.

SOUTH AMERICA.

- General.** *Ausland* 66 (1893): 11-14, 26-28, 41-44, 54-53. **Thering.**
Die Paläo-Geographie Südamerikas. Von H. von Thering (Rio Grande
do Sul).

A sketch of the geological conditions of the continent, and of its geographical evolution, based largely on the phenomena of fossil and recent plant and animal distribution.

- Andes.** *Zeitsch. Ges. Erdkunde, Berlin* 27 (1892): 249-348. **Brackebusch.**
Die Kordillerenpässe zwischen der Argentinischen Republik und Chile,
vom 22° bis 35° S. B. Von Prof. Dr. Ludwig Brackebusch.

A comprehensive review of the passes across the Andes, between Chile and the Argentine Republic, with a map.

- Bolivia.** **Quijarro.**
Los Territorios del Noroeste de Bolivia. Vías de comunicación que les
corresponden. Por el Dr. Antonio Quijarro. Buenos Aires, 1892: 8vo,
pp. 43. *With map. Presented by the Author.*

- Ecuador.** *Verhand. Ges. Erdkunde, Berlin* 19 (1892): 508-527. **Wolf.**
Herr Dr. Theodor Wolf: Ueber das westliche Tiefland Ecuadors.
See abstract in *Geographical Journal* for February, p. 154.

- Guatemala.** *Pet. Mitt.* 33 (1893): 1-14. **Sapper.**
Beiträge zur Ethnographie der Republik Guatemala. Von Dr. Karl
Sapper in Coban.

- Guatemala.** *Zeitsch. deutsch.-österreich. Alpenvereins* 23 (1892): 367-392. **Sapper.**
Das Kettengebirge von Mittelguatemala. Von Dr. Carl Sapper.

AUSTRALASIA AND PACIFIC ISLANDS.

- Hawaii.** *Verhand. Ges. Erdkunde, Berlin* 19 (1892): 492-508. **Marcuse.**
Herr Dr. Adolf Marcuse: Die Erdmessungs-Expedition nach den
Hawaiischen Inseln.

See extract in *Geographical Journal* for February, p. 173.

New Guinea.

[MacGregor.]

Handbook of Information for Intending Settlers in British New Guinea.
Published by Authority. Brisbane, 1892: 8vo, pp. 34. *Map.*

Sir William Macgregor has drawn up an authoritative sketch of the laws in force in New Guinea, with full extracts of the statutes relating to the acquisition of land, to labour, and to the Customs tariff.

New Hebrides.

Somerville.

A Vocabulary in Various Dialects used in some islands of the New Hebrides, South Pacific. Compiled from various sources by Lieut. Boyle T. Somerville, R.N. 1892: oblong, pp. 58. *Presented by the Hydrographer of the Admiralty.*

POLAR REGIONS.**Eskimo.**

Nansen.

Eskimoliv, af Fridtjof Nansen, med illustrationes af Otto Sinding. Kristiania: Aschehoug, 1891: 8vo, pp. viii. and 296. *Presented by the Author.*

Spitzbergen.

Nordenskiöld.

Redogörelse för den Svenska Expeditionen till Spetsbergen, 1890, af G. Nordenskiöld. Stockholm, 1892: 8vo, pp. 94. *Plates. Presented by the Author.*

A reprint from the transactions of the Royal Swedish Academy of Sciences. The paper describes the author's work on a visit to Spitzbergen. Appendices give lists of some of the plants and animals collected, tables of temperature observations in the fjords, and a description of the series of fine photographs of glaciers with which the memoir is illustrated.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.**Ground-water.**

King.

Observations and Experiments on the Fluctuations in the Level and Rate of Movement of Ground-water on the Wisconsin Agricultural Experiment Station Farm, and at Whitewater, Wisconsin. By Franklin H. King (Bulletin No. 5 of the Weather Bureau, U.S., Department of Agriculture). Washington, 1892: 8vo, pp. 76. *Numerous illustrations. Presented by the U.S. Weather Bureau.*

Maps.

Basevi and Fritzsche.

A. Basevi. G. E. Fritzsche. La Rappresentazione orografica a Luce Doppia nella cartografia moderna. Roma: Istituto Cartografico Italiano, 1892: 8vo, pp. 24. *With plate. Presented by the Authors.*

A paper on mountain shading read to the Geographical Congress at Genoa.

Photographic Surveying.*Comptes Rendus* 116 (1893): 232-235.

Laussedat.

Sur les progrès de l'art de lever les plans à l'aide de la Photographie, en Europe et en Amérique. Note de M. A. Laussedat.

Notes on the use of photography in the Survey of the land bordering the Canadian Pacific Railway by Mr. Deville.

Soil.*Pet. Mitt.* 39 (1893): 17-19.

Tillo.

Die geographische Verteilung von Grund und Boden. Von Dr. Alexis von Tillo, Generalmajor.

A calculation of the area of the Earth's surface occupied by each variety of soil or superficial deposit.

Soil and Climate.

Hilgard.

A Report on the Relations of Soil to Climate, by E. W. Hilgard, Professor of Agricultural Chemistry, University of California (Bulletin, No. 3, Weather Bureau, U.S. Department of Agriculture). Washington, 1892: 8vo, pp. 60. *Presented by the Weather Bureau.*

Volcanoes.

Daubrée.

Application de la méthode expérimentale au rôle possible des Gas Souterrains dans l'histoire des Montagnes Volcaniques. Par A. Daubrée. Paris, 1892: 8vo, pp. 28. *Presented by the Author.*

M. Daubrée succeeded in perforating pieces of different kinds of rock by exploding a small charge of dynamite or cotton-powder in a strong vessel closed by a slice of the rock in question. The results led him to regard explosions of subterranean gases as the origin not only of volcanic vents, but of the singular clay-filled tunnels which are a feature of the South African diamond-fields.

Volcanic Phenomena.

Reyer.

Geologische und Geographische Experimente. Von Ed. Reyher II. Heft. Vulkanische und Massen-Eruptionen. Leipzig, Engelmann, 1892: 8vo, pp. 56. *Presented by the Author.*

A series of experiments reproducing on a small scale some of the movements of strata associated with volcanic outbursts, and illustrated by 215 diagrammatic figures.

Winds and Currents. *Verhandl. Ges. Erdkunde Berlin* 20 (1893): 63-87. Schott.

Herr Dr. Gerhard Schott: Eine Forschungsreise auf einem Segelschiff nach den ostasiatischen Gewässern. *With map of route.*

A summary of this paper appears elsewhere.

GENERAL.**Barometric Pressure.**

Cole.

The Diurnal Variation of Barometric Pressure. By Frank N. Cole, PH.D. (Bulletin No. 6. Weather Bureau, United States Department of Agriculture). Washington, 1892: 8vo, pp. 32. *Presented by the Weather Bureau.*

A mathematical discussion dividing the daily curve of pressure into three components with periods of twenty-four, twelve and eight hours, by harmonic analysis. Dr. Buchan's recent explanation of the diurnal phenomena is not referred to.

Bibliography.

Cardon.

Pubblicazioni Geografiche stampate in Italia fra il 1800 e il 1890. Saggio di Catalogo compilato da F. Cardon. Roma, Società Geografica Italiana 1892: 8vo, pp. xx. and 310. *Presented by Miss Cust.*

A catalogue of the Italian geographical works of this century prepared for the Geographical Congress at Genoa.

Biography—Breusing. *Verhandl. Ges. Erdkunde, Berlin* 19 (1892): 527-532. Wagner.

Arthur Breusing von Hermann Wagner.

Another geographical notice by Eugen Gelcich, with portrait, appears in the *Deutsche Rundschau* 15 (1893), 220-232.

Biography—Joule.

Reynolds.

James Prescott Joule. By Osborne Reynolds, LL.D., F.R.S. *Memoirs and Proceedings of the Manchester Literary and Philosophical Society*, Vol. VI, Fourth Series, Manchester, 1892: 8vo, pp. 196. *Price 10s. 6d. Presented by the Literary and Philosophical Society.*

Capistran's Chronicle.

Ymer. (Dec., 1892): 21-43.

Bildt.

Den s. k. Capistrani krönika i Chigianska biblioteket i Rom. Af C. Bildt.

A discussion of the pretended Chronicle of John Capistran in the Chigi library at Rome, with facsimiles of two pages, and transcription of part of the Latin text relating to Norway, Iceland, and Vinland.

Colonies.

Beadon.

The Solution of the Colonial Question. By Robert Beadon. Large 8vo, pp. 20. *Presented by the Author.*

Reprinted from the *Imperial and Asiatic Quarterly Review*, January 1893.

Columbus.

Bul. Soc. Roy. Belge Geog. 16 (1892): 553-587.

Du Fief.

Christophe Colomb et la découverte de l'Amérique. Par J. du Fief. *With maps and illustrations.*

Educational.*Bol. Soc. Geog. Italiana* 5 (1892): 1031-1072.

A series of papers on the teaching of geography read at the Genoa Congress. The articles by Professors Bertacchi, Canevello, Dalla Vedova, and Pennesi, deal with geographical instruction in secondary schools and in universities.

Emigration.**Nery.**

L'Emigration et l'Immigration pendant les dernières années. Par F. J. de Santa-Anna Nery. Paris, Guillaumin et Cie., 1892: 8vo, pp. 76. Price 1 fr. Presented by the Author.

A study on emigration chiefly to the United States and Brazil, from France and Italy, read at the Geographical Congress at Genoa.

Geographical Congress.

Il Congresso Geografica Italiano. Relazioni su alcune tesi e Comunicazioni da presentarsi alla Sezione Prima del Congresso. Autori Bianchi, Botto, Dobrn, Florini, Grablovitz, Marinelli, Paganini, Roncagli, Sergi. Roma, Società Geografica Italiana, 1892: 8vo, pp. 112.

Ibid. Sezione Seconda, Autori Careri, Corte, Magliano, Rossi, Scalabrini, Sitta, Vedovelli, Volpe-Landi, pp. 68.

Ibid. Sezione Terza, Autori Bertacchi, Canevello, Marinelli, Pennesi, Porena, pp. 86. Presented by Miss Cust.

German Colonies.**Meinecke.**

Koloniales Jahrbuch. Herausgegeben von Gustav Meinecke, Fünfter Jahrgang. Das Jahr 1892. Berlin, Heymann, 1893: 8vo, pp. 308. Price 10s. 6d.

Apart from special papers on the German colonies there is an article of some general importance on the effect of tropical climates on Europeans, by Dr. O. Schellong.

Maps.**Ruge.**

Die Entwicklung der Kartographie von Amerika bis 1570. Von Dr. Sophus Ruge. Gotha, Perthes, 1892: 4to, pp. 86, maps. Price 5 marks.

Ergänzungsheft, No. 106 of *Petermann's Mitteilungen*, which will be specially noticed.

Models.*Scot. Geog. Mag.* 9 (1893): 83-87.**Goodchild.**

Notes on the Construction of Topographical Models. By J. G. Goodchild, H.M.'s Geological Survey.

A useful description of the construction of a large-scale relief model of Edinburgh, showing all the diversities of site. The method employed is in many respects novel, and seems likely to be capable of extensive use.

Military Geography. *Zeit. deutsch.-österreich. Alpenvereins* 23 (1892): 45-83. **Baumann.**

Das Kriegswesen im Hochgebirge. Von J. Baumann (k. b. Hauptmann).

Oriental Literature.**Schlegel.**

La Sièle Funéraire du Teghin Giogh et ses copistes et traducteurs Chinois, Russes et Allemands par G. Schlegel. Helsingfors, 1892: large 8vo, pp. 58. Presented by the Author.

Partition of the Earth.*Ansland* 65 (1893): 65-69.**Oppel.**

Die Teilung der Erde. Von A. Oppel (Bremen).

A general discussion of the areas and populations of the portions of the Earth occupied or claimed by organised governments and of those still unappropriated.

Pearls.**Calvert.**

Pearls: their origin and formation. By Albert F. Calvert. London, Milligan & Co.: 12mo, pp. 32. Price 1s. Presented by the Author.

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London.

Bartholomew.

New Plan of West London. By John Bartholomew, F.R.G.S. Scale 3·2 inches to 1 mile (stat.). J. Bartholomew & Co., Edinburgh, 1893. *Price 1s. Presented by the Publishers.*

Scandinavia.

Johnston.

Map of Sweden, Norway, and Denmark. Constructed and engraved by W. & A. K. Johnston, Edinburgh and London. Scale 1:1,649,800, or 22·6 geographical miles to an inch. 2 sheets. *Presented by Messrs. W. & A. K. Johnston.*

Switzerland.

Stanford.

Stanford's London Atlas Map of Switzerland. Scale 1:506,880, or 6·9 geographical miles to an inch. London: E. Stanford. *Price £2 2s. Presented by the Publisher.*

This is a special edition of a map of Switzerland, produced by sun engraving, which will afterwards appear in Stanford's New London Atlas. (See notice, p. 239.)

ASIA.

India and the East.

Bartholomew.

Route Chart to India and the East, on Mercator's Projection. By John Bartholomew, F.R.G.S. Scale (Equ.) 1 inch to 5·5. J. Bartholomew & Co., Edinburgh, 1893. *Price 1s. 6d., on cloth. Presented by the Publishers.*

This is a nicely drawn little map, on which all the routes to India are laid down, with their distances in miles and the average time occupied on each route. Maps on an enlarged scale of the principal places visited on the voyage from England to India are given on insets.

AFRICA.

Africa.

Service Géographique de l'Armée.

Carte de l'Afrique, à l'Echelle de 1:8,000,000, or 109·7 geographical miles to an inch. Dressée et publiée par le Service géographique de l'Armée. Paris, 1892. Sheets 5 and 6. Price 1 fr. 50 cents, each sheet. Presented by E. Stanford, Esq.

These two sheets contain South Africa and Madagascar; they are excellent specimens of cartography, and have been carefully brought up to date.

Africa.

Fees.

Schulwandkarte von Afrika von Theodor Fees. 1:600,000, or 8·2 geographical miles to an inch. Wien, E. Hölzel. 6 sheets. Price 9 marks.

GENERAL.

The World.

Johnston.

W. & A. K. Johnston's Royal Atlas of Modern Geography. Edition in monthly parts. Part 16. W. & A. K. Johnston, Edinburgh and London, 1892. Price 4s. 6d. each part. Presented by the Publishers.

The present issue of this atlas contains maps of China and Japan, and the north-east portion of a four-sheet map of the United States. An index to the map of China and Japan is given, but that for the map of the United States does not appear in the present part.

The World.

Cassell.

The Universal Atlas. Complete in 28 parts, including Index. Published by Cassell & Co., Limited, London, for the Atlas Publishing Company, Limited. Part 23. Price 1s. Presented by the Publishers.

This part contains maps of Austria, Hungary, Polynesia, a West African Colonial map, and a portion of the index.

The World.

Juan de la Cosa.

Facsimile of Juan de la Cosa's map of the World, A.D. 1500. By Señor Antonio Cánovas Vallego and Professor Traynor, Madrid, 1892. Price 18 pesetas, with descriptive pamphlet. (Dulan.)

At the present time, in connection with the Columbus celebration, there appears to be a laudable movement on the part of geographers to publish carefully executed facsimiles of ancient and rare maps at a moderate price, thus bringing them within reach of students of history and geography. The present reproduction of Juan de la Cosa's map is an example, and has the advantage of being a faithful copy as regards colouring, size, and every other detail. It is also accompanied by a well-written description of the map, and a biographical sketch of the author's life and voyages, which is printed in Spanish, French, and English.

World.

Santa Cruz.

Map of the World by the Spanish Cosmographer Alonzo de Santa Cruz, 1542. Reproduction in phototypic facsimile by the printing office of the Swedish Staff-General. With explanations by E. W. Dahlgren, Secretary of the Swedish Society of Anthropology and Geography. Stockholm, 1892.

World.

Oppel.

Erdkarte darstellend die Entwicklung der Erdkenntnis vom Mittelalter bis zur gegenwart in Stufen von Jahrhunderten entworfen und gezeichnet von Dr. Alwin Oppel. Mercator's projection. Equatorial Scale 1:20,000,000, or 204 geographical miles to an inch. Lithographie, Druck und Verlag der Topographischen Anstalt Winterthur J. Schlumpf, vormals Wurster, Randegger & Cie., in Winterthur. 6 sheets.

This is a six-sheet map of the World illustrating the progress of discovery from the earliest time to the present date. It is intended for the use of schools, is printed in colours and drawn in a style well suited to the purpose for which it has been published. Notwithstanding what the author says in his accompanying pamphlet, it is a pity that one rule was not adhered to throughout with regard to giving the names of explorers,

as there seems no sufficient reason why the names of early explorers might not have been given on every continent. This would have been a much better plan than giving some in America and Asia, and none in Africa. The boundaries of the Macedonian and Roman Empires are shown, together with the extent of the geographical knowledge of ancient and mediæval terms.

CHARTS.

North Atlantic Ocean.

U.S. Hydrographic Office.

Pilot Chart of the North Atlantic Ocean. February, 1893. Published at the Hydrographic Office, Bureau of Navigation, Navy Department Washington, D.C. Presented by the U.S. Hydrographic Office.

Oporto.

"O Commercio do Porto."

Port of Leixões, New Harbour (Oporto, Portugal). Hydrographical Chart published by the daily paper *O Commercio do Porto*. According to the topography and soundings made by the Portuguese Government in the harbour, April, 1899; view of the entrance of the port; its situation in relation to the bar of the River Douro and the city of Oporto. 1892. Scale 1:2500, or 29.1 inches to a geographical mile. Presented by the *Associação Commercial do Porto*.

PHOTOGRAPHS.

Japan.

Milne.

Thirty-four photographs of natives (Ainu) of Yezo Island, Japan. By Professor J. Milne, F.R.S. Presented by Professor J. Milne.

These photographs have been taken by Professor Milne, in the island of Yezo, and presented by him to the Society. They are of great interest, forming as they do a complete set of views illustrating the dwellings and appearance of the Ainu race.

Sikkim.

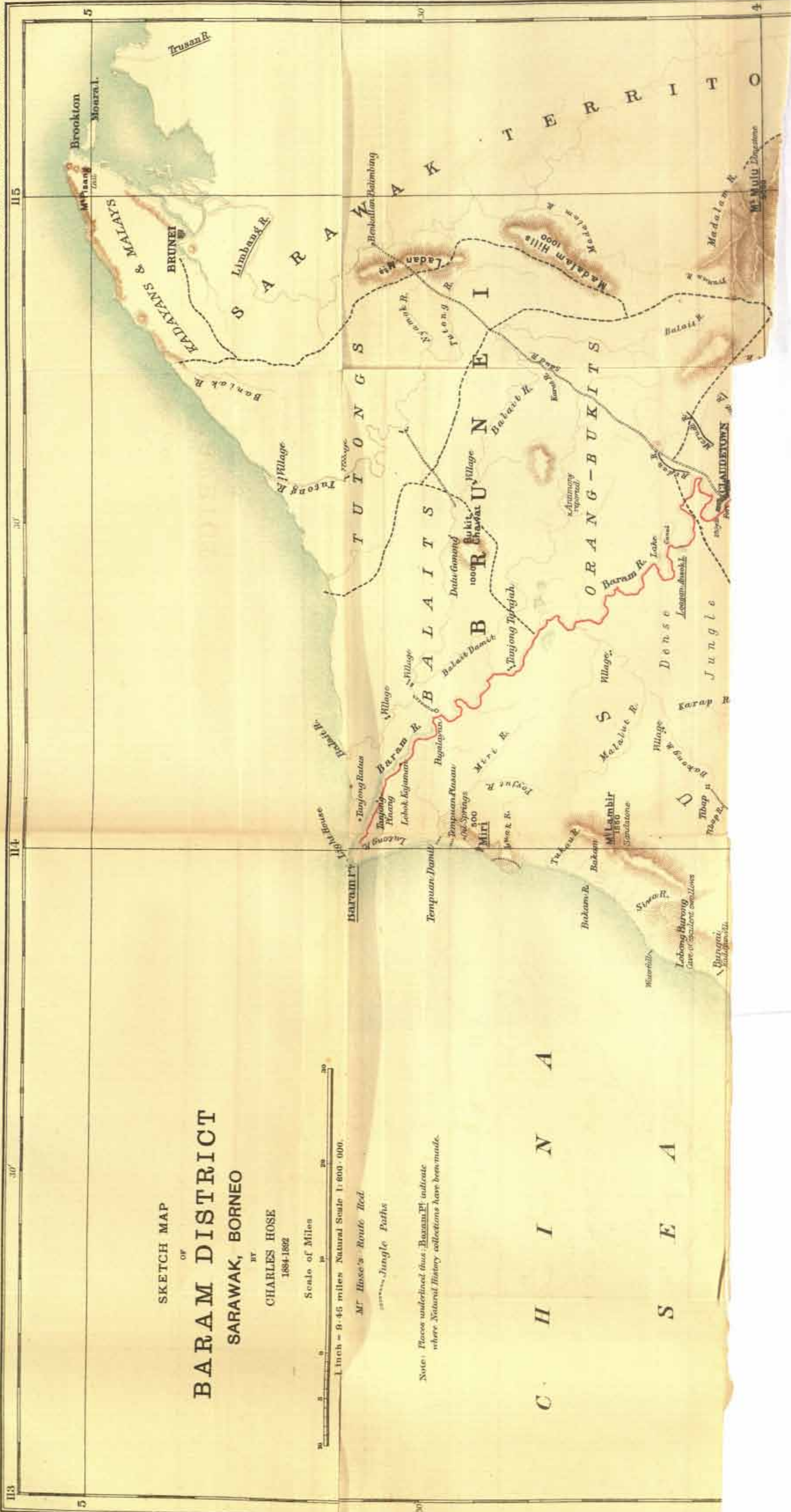
Hoffmann.

Twenty-three Photographs of Mountain Scenery in Sikkim, taken by Theodore Hoffmann, Esq., 1892. Presented by Messrs. Johnston and Hoffmann, Darjiling.

This is an excellent series of photographs, taken by Mr. Theodore Hoffmann, in Sikkim, and presented to the Society by that gentleman. The route followed by Mr. Hoffmann is described in the Royal Geographical Society *Proceedings*, September, 1892, and this account, with the accompanying sketch-map, will be useful for reference, as showing the points from which the photographs were taken. Among the most striking, are views of Tezong Waterfall, above Talung, the Talung Monastery, Cane Bridge, over the Teesta at Sanklan Sampo, Road between Sanklan Sampo and Sengthem, North Face of Siniolchu, Spur running north of Siniolchu, View on the east side of the Lungla-la, Snow Bridge over the Zemuchu, View from the Lungla-la, Kanchinjanga in the distance, North-east face of Kanchinjanga, Ice Caverns at the end of the North Kanchinjanga, Tibetan Encampment at Lo-nag. Although special mention has been made of the above, every view in the series is not only a beautiful specimen of photography, but, from a geographical point of view, gives a more accurate idea of the physical features and grand mountain scenery of Sikkim than could possibly be done by either a verbal or written description. It may be mentioned that Mr. Hoffmann has, on previous occasions, greatly increased the value of the Society's collection by his donations of photographs.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





SKETCH MAP
OF
BARAM DISTRICT
SARAWAK, BORNEO

BY
CHARLES HOSE
1884-1892

Scale of Miles
1 inch = 8.45 miles Natural Scale 1:600,000

Hose's Route Red
Jungle Paths

Note: Places underlined thus: Baram indicate where Natural History collections have been made.



The Geographical Journal.

No. 4.

APRIL, 1893.

VOL. I.

TWENTY YEARS IN ZAMBESIA.*

By FREDERICK COURTNEY SELOUS.

I COMMENCED my African ramblings in 1871. At that time the facilities for reaching the interior from the Cape Colony were very different from those which are now available, as there was only one short line of railway from Cape Town to the village of Wellington in existence in the whole country.

Landing at Algoa Bay on September 4th, I at once proceeded to the Diamond Fields by bullock waggon, a journey which occupied two months. At that time neither diamonds nor gold had any charm for me, as my only desire was to get away into the far interior; but as I found that it would be inadvisable to start on such a journey until the rainy season was over, I bought a waggon and oxen, and spent the intervening time in a trading trip through Griqualand, and down the northern bank of the Orange River as far as the country of Klas Lucas, a Namaqua or Koranna chief.

In April, 1872, accompanied by two young men of about my own age, Messrs. Dorehill and Sadleir, I set out for Matabeleland. We had one waggon and span of oxen between us, and, as our money had run short, were rather badly fitted out for a long journey in the way of stores and trading goods. However, we had heard that elephants were plentiful in Matabeleland, and, being young and hopeful, we thought that everything would come right when we got amongst the tuskers, as indeed it did. The route we followed was the old trade road which skirts the eastern edge of the Kalahari desert, passing through Kuruman and Molepololi, and from thence to Shoshong, in the country of the Bamangwato, who were then ruled over by Machin. This chief was as much disliked by the traders living in his country as the present

* Read at the Meeting of the Royal Geographical Society, February 13th, 1893. Map, p. 384.

ruler, Khama, is honoured and respected. At Sechele's town (Molepololi) we had met Mr. Frank Mandy, who was also on his way to Matabeleland, and who, having been there before, was personally acquainted with Lo Bengula* and his people; and we all travelled together as far as Bulawayo, which we at length reached in the end of August.

As Lo Bengula has of late years become such a well-known personality in Zambesia, and may become much better known in the near future, I may perhaps be pardoned for quoting the account I wrote of my first interview with him, now more than twenty years ago:—

"We found that owing to the scarcity of grass for cattle near the chief town, Lo Bengula had trekked away and built a temporary kraal near Amachi Mashlopay (white stones); so we too trekked straight across the country to where he was, getting there towards evening. Here we found Mr. G. A. Phillips, who had already been eight years in the country, trading and hunting, and he kindly gave us a goat to slaughter. The following morning Lo Bengula, king of the powerful tribe of the Matabele (or Amandebele, as they should be called), came down to our waggons. He is a man standing about 5 feet 10 or 11 inches, strongly and stoutly built, and even at that date was growing very fat. He was then dressed in a greasy shirt and dirty pair of trousers; but I am happy to say that he soon afterwards discarded European clothing, and now always appears in his own native dress, in which he looks what he is—the chief of a savage and barbarous people. After saying a few words to Mandy, whom he knew, and seemed pleased to see again, he asked who was the owner of the other waggon, and being told by Mr. Phillips, who acted as interpreter, that I was, he asked me what I had come to do. I said I had come to hunt elephants, upon which he burst out laughing, and said, 'Was it not steinbucks' (a diminutive species of antelope) 'that you came to hunt? Why, you're only a boy!' I replied that, although a boy, I nevertheless wished to hunt elephants, and asked his permission to do so, upon which he made some further disparaging remarks regarding my youthful appearance, and then rose to go without giving me any answer. He was attended by about fifty natives, who had all been squatting on the ground in a semicircle during the interview, but all of whom, immediately he rose to go, cried out 'How! how!' in a tone of intense surprise, as if some lovely apparition had burst upon their view; then, as he passed, they followed, crouching down, and crying out, 'Oh, thou prince of princes! thou black one! thou calf of the black cow! thou black elephant!'" etc., etc.

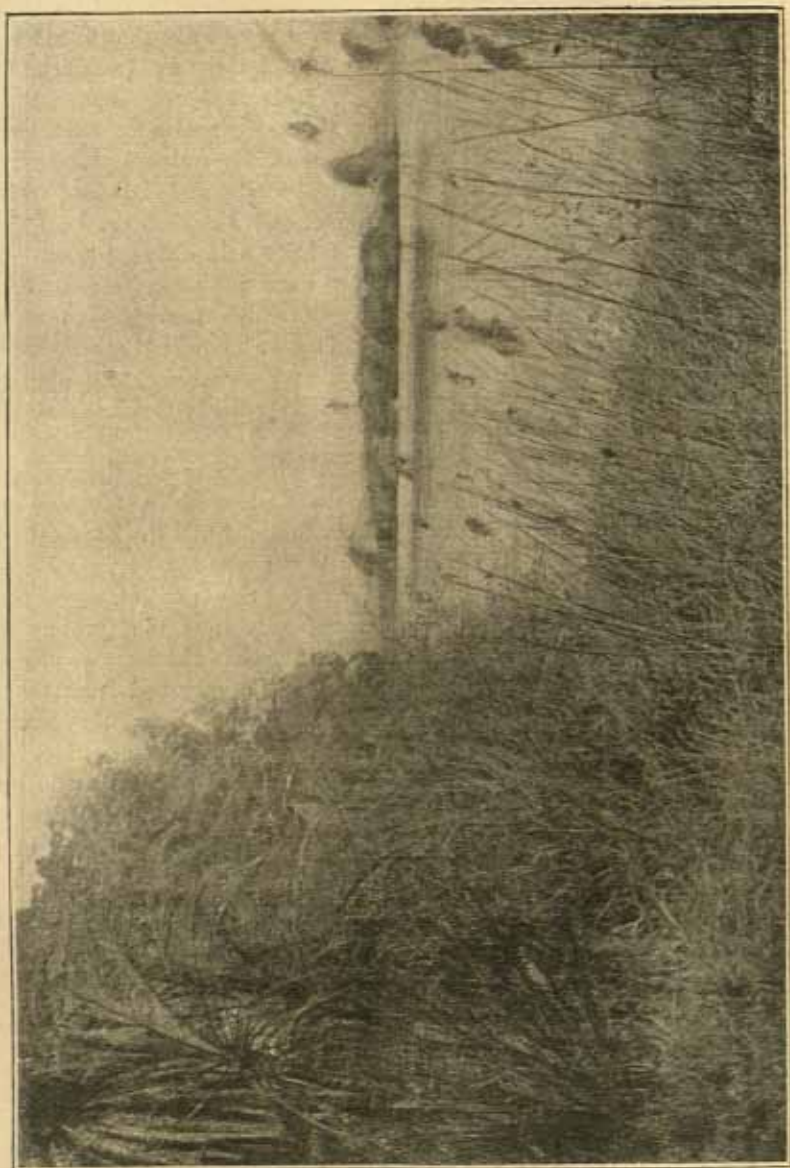
Finally Lo Bengula gave me permission to go and hunt wherever I pleased, as I was only a boy, and I took to the life so kindly that for

* The correct pronunciation is Lo Beng-ula, not "Ben-gula," as is common.

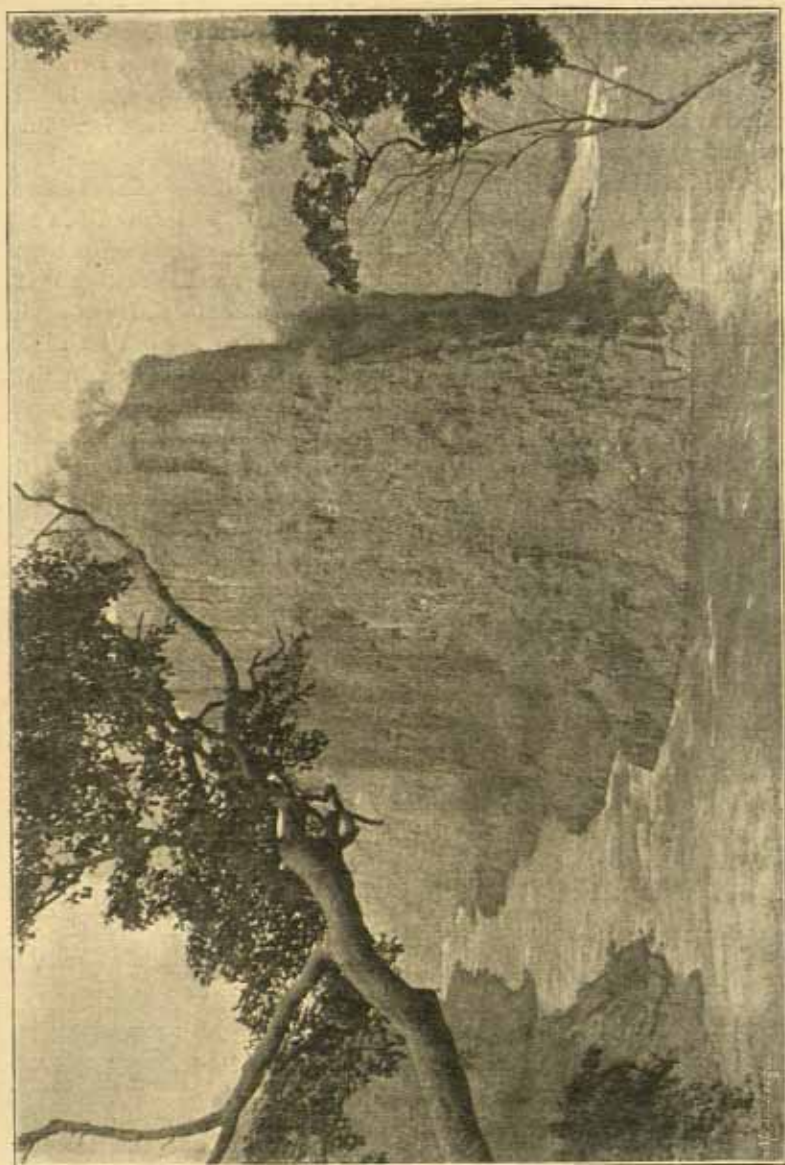
three years I remained in Zambesia, without ever experiencing the slightest desire to exchange my free wild life for the comforts and restraints of civilisation. During that period I travelled over a great deal of country; but, being always engaged in elephant hunting, which occupied all my time and attention, I am sorry to say that I did no surveying work whatever. The rainy seasons I spent in Matabeleland, not remaining in one place, but travelling about the country trading with the natives. In this way, during the rainy season of 1873, and again in 1874, I travelled all over the splendidly-watered plateau, in which the Nwanetsi, Lundi, and Tukwi Rivers take their rise, and went as far south as the junction of the Ingesi and Lundi Rivers not far from Mount Bufwa. Unfortunately, as I have said above, I made no sketch maps of these journeys; but they were not altogether useless, as it was my remembrance of the way in which George Wood and myself piloted our waggon through this country which enabled me sixteen years later to undertake, with an easy conscience, to guide the British South Africa Company's Pioneer Expedition to Mashonaland through this same country in 1890.

During the dry seasons—from May till November—of these three years, I travelled and hunted always on foot, with a few native carriers, all over the country between Matabeleland and the Zambesi, as far eastwards as the Sanyati River, and westwards to the Victoria Falls, and up the Chobe or Kwando River as far as the Sunta outlet.

In 1874 I found a lot of Masubias, refugees from the tyranny of Sipopo, chief of the Barotsi tribe, living on islands in the marshes of the Chobe, and in a very miserable condition, as, having fled from their homes without being able to carry any food with them, they were reduced to all kinds of shifts to save themselves from starvation. I found them living principally upon fish and a kind of meal made by pounding up the dried roots of a water plant. They were also eating a kind of food which looked exactly like sawdust. This, I found, was made from the roots of the palm tree, which are first roasted under the ashes of a fire and then hammered, when this substance falls out between the fibres. They said it was very good, and I took their word for it, but did not try it. I became very friendly with these people, and spent some months amongst them; and as during that time I shot twenty-four elephants, besides other large animals, every ounce of every one of which they used as food, I think I may say that I was a welcome visitor. I was the first white man any of the women and children had ever seen, though some of the men said they had seen Dr. Livingstone in Sekeletu's time. It was during the dry season of 1874 that I first noticed that the waters of the Chobe were rising instead of falling, although every day the weather was getting hotter and hotter. I noticed this phenomenon more carefully in subsequent years, and will refer to it later on.



VIEW ON THE ZAMBEZI ABOVE THE VICTORIA FALLS.



VIEW ON THE ZAMBEZI BELOW THE VICTORIA FALLS.

In 1875 I returned to England, going back to South Africa again early the following year.

As the health of Zambia is just now a much-discussed question, I will here say a few words on the subject, giving my own experiences during three years of continuous residence in all parts of the country.

Owing to severe exposure to wet and cold during several days and nights, in the early part of 1872, I got an attack of fever and ague in Griqualand so that I was handicapped before starting for the interior. This fever and ague was exactly what I have seen people get on the high plateau of Mashonaland, during the last few years, from similar exposure to rain and cold. It took me some time to shake off, and was still in my system when I reached Matabeleland, but the attacks only came on when I halted anywhere for a few days. During November and December 1872, hunting down in the low hot country towards the Zambesi, I was again very much exposed to wet, and on several occasions lay out all night long, without any shelter, drenched through with such heavy rain that it put out the largest fire and converted hard ground into a swamp. I naturally again got soaked with fever poison, but as long as I remained hunting the disease did not show itself. Directly I got back to Bulawayo it broke out, and during a month or so I had several sharp attacks. By that time, however, my sound constitution had choked all the fever germs, and from that day until in 1878, when very severe exposure in Central Africa once more filled me up with malarial poison, I do not remember ever to have had one single hour's illness or to have taken one drop of medicine. The life I led was, however, if a very hard, at any rate, in many respects, a very healthy one; for the most part I ate nothing but meat and Mashona rice, and drank nothing but tea, usually without milk and sugar, not because I like it so, but because those adjuncts were unobtainable.

In 1877 I again visited the Chobe and Zambesi Rivers, elephant hunting, but had a very bad season, as we could not come across elephants; so towards the end of the year I sent my waggons back to Matabeleland, but instead of going with them resolved to cross the Zambesi and try and find a good elephant country to the north of that river. I was accompanied on this journey by Mr. L. M. Owen, a gentleman well known in South Africa. We started on October 30th from Pandamatenga, with four pack-donkeys and a few native carriers, and a few days later crossed the Zambesi at Wankie's town, swimming the donkeys through the river at the tail of a canoe without difficulty. At this time of the year the heat in the Zambesi valley is intense and very enervating and oppressive. On November 3rd the thermometer marked 87° at day dawn, the coolest time in the twenty-four hours: and at midday in the shade of very thick foliaged trees, with a breeze blowing beneath, it ranged from 103° to 110° as long as we were on the river.

As I thought that elephants were sure to be plentiful in the neighbourhood of the Kafukwe and Loangwa Rivers, and also in the country between those rivers, I determined first of all to follow the course of the Zambesi as far as the mouth of the Kafukwe before leaving the former river. Where we crossed the Zambesi the people belong to the Manansa tribe, and are an offshoot of the Makalakas. These people are mild and peaceable in disposition, and friendly to travellers. Formerly they inhabited a large tract of country to the south of the Zambesi, and to the westward of the River Gwai, from which they were driven with great slaughter by the Matabele.

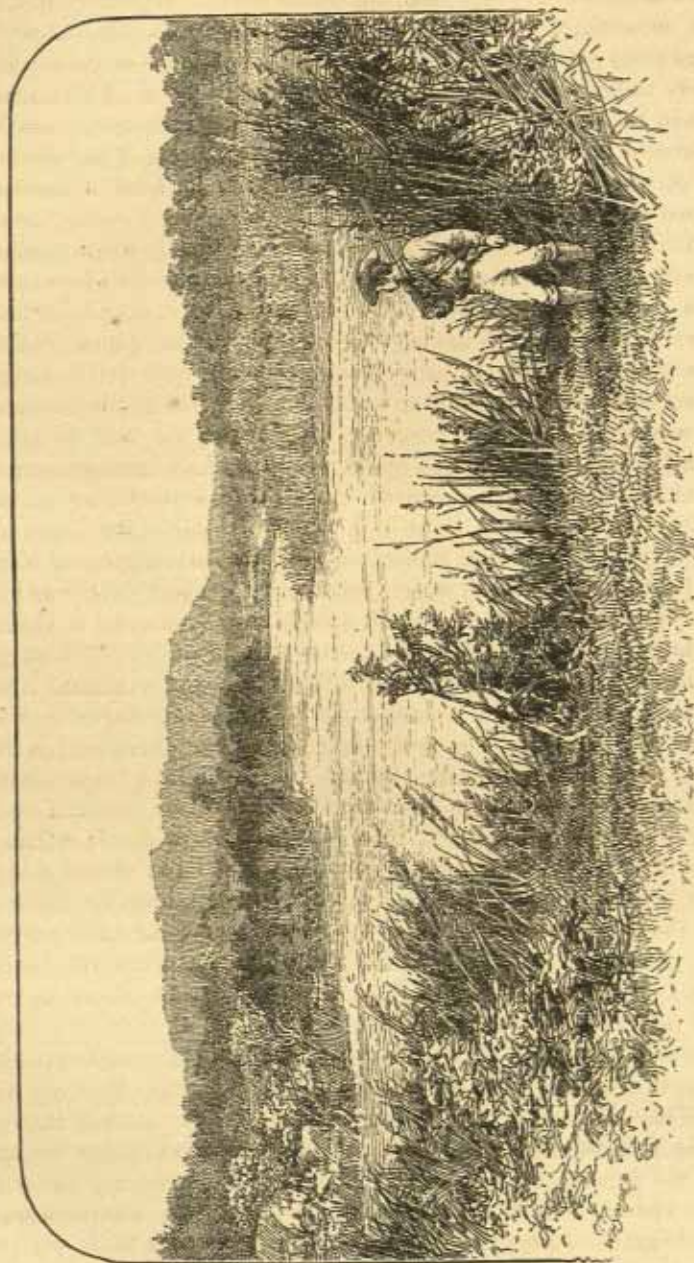
On the second day after leaving Wankie's village we got amongst the Batongas, a people who now have an evil reputation, and which is well deserved. At the time of our visit to them, however, in 1877, no white man had travelled amongst them since Dr. Livingstone, Charles Livingstone and Dr. Kirk passed through their country in 1861, so that we were still something strange and new to them, and the awe with which we inspired them overcame their innate rascality. They gave us no trouble whatever, and indeed, were very civil, the headman of almost every village we passed through presenting us with a goat, for which, of course, he always got a "quid pro quo." Both banks of this part of the Zambesi seemed very thickly populated by these people, their villages being very close together, with almost all the intermediate ground cleared for cultivation. In every village stood a large dovecot, whose inmates kept up an incessant cooing. This peaceful state of things, however, did not last long, as beyond the River Chaisa fighting had recently been going on between Kanyemba, the Capitão Mor of Zumbo, and the Batongas, and as Kanyemba's men were well armed with guns, and the Batongas had only assegais, the latter had got very much the worst of it. We passed many villages from which the owners had been driven, and their huts and corn bins burnt. At one place we passed the remains of a man and woman lying on the footpath. Many people must have been killed, as the stench was often offensive, though the bodies had been dragged into the neighbouring bush by the hyenas.

Just at sundown one evening about fifty Batongas came down to our camp near the site of a burnt village, each of them carrying from four to eight assegais. They seemed very friendly when they heard we were Amangees (English). The Enduna told us that all their towns and corn bins had been burnt, they themselves shot down, and their women and children carried off into slavery by the Shakundas. They now were living in the bush with the remnants of their belongings. This man gave us two goats, saying he was very pleased to see Englishmen, as he had heard they did not trouble people. At one place we met a Batonga army of about three hundred men who were going to attack a half-caste Portuguese trader, named Monteiro, who was living on a large island in the Zambesi with a strong following of Shakundas. At

this juncture all our carriers threw down their loads and bolted, so that we were obliged to get men from the Batongas to carry our things, and had to accompany them to near Monteiro's camp. That night the Batonga army was encamped all round us, but they were very orderly, and gave us no trouble whatever. During the night the Shakundas on the island beat their war drum, and bade defiance to their enemies, who only listened in sullen silence. The next morning five of our own men (three of whom themselves were Batongas) returned, but the men we had hired at Wankie's never turned up again. The following morning more Batongas kept coming in, all decked out in war costume. Some of them were, with their large feather head-dresses, as ferocious-looking savages as I have seen, and except for the head-dresses about half of them were perfectly stark naked. There was only one gun, an old flint-lock, in the entire Batonga army; but they were very rich in assegais, none carrying less than four, and many of them as many as eight of these weapons. No fight, however, took place, as each party was apparently afraid to attack the other, and at last an arrangement was come to and the Batongas retired, their Enduna supplying me with seven carriers in place of those that had run away. At length after many delays we reached, on November 24th, the narrow gorge of Kariba, where the mighty Zambesi, which just above is a great river over half a mile in breadth, has worn for itself a deep narrow channel in the hard rock, through which it rushes at a terrific pace in a series of whirlpools and eddies. I went a long way down this gorge and examined it carefully, and in many places it cannot be more than 60 yards in width, as I balanced myself on the rocks on one side and threw stones right across. From the high-water marks I should think that when in flood the Zambesi must here rise quite 20 feet above its level when I saw it, and its breadth would then be over 200 yards. The Sanyati empties itself into the Zambesi from the south, just at the entrance of Kariba gorge. Its bed is one mass of huge boulders of rock, and about 150 yards broad, but when I saw it, at the end of a very dry season, there was but a mere dribble of water running into the Zambesi, though I can easily understand that after heavy rains it may be transformed into a roaring torrent.

To avoid the hills of Kariba we took a path which passed at the back of them, through dry, desolate-looking, Mopani forests. The only water we saw we obtained at the bottom of a deep well that had been dug by some natives near their village. On the following day we again struck the Zambesi at Nyampunga. In no part of the great river that I have visited—and I have followed its course for several hundred miles altogether—have I seen as many hippopotami as there are in the reaches beyond Nyampunga. We often saw two or three large herds, of from fifteen to twenty animals in each, in the course of a mile.

On November 28th we crossed the Losito River, and soon afterwards



LCNDI RIVER, LOOKING EAST.

reached Nyaukwe. This place had lately been the headquarters of some Portuguese or half-caste traders, and the remains of eight square huts, with verandahs round them, were still standing. Shortly before our arrival, in the absence of most of the male inhabitants who were with Kanyemba, Nyaukwe had been attacked by a party of Batongas, who had burnt down and destroyed most of the huts. The inhabitants had all managed to escape across the river in their canoes, and at the time of our visit were living in little straw makeshifts for huts on the white sand along the water's edge.

At this place we re-crossed the Zambesi to the southern side, and learned from the fugitives from Nyaukwe that there was a white man—a Portuguese—living on an island a few miles lower down the river. A little before sundown we got opposite the place, and Senhor Joaquim Mendonça sent a boat to bring us to his island. We here remained a fortnight, and during that time I went down with Mendonça to the mouth of the Kafukwe River on a visit to Kanyemba. At that time I believe that the slave trade was still legal in the Portuguese possessions, being only finally abolished on January 1st, 1878, so that we could not be surprised at the sight of slaves in chains. Unfortunately, so little power has the Portuguese Government to enforce its laws in the interior of South Eastern Africa, that in 1891 slavery was still being carried on on the central Zambesi by men holding the official title of *Capitão Mor*, very much as at the time of my first visit in 1877. Both during our first visit and on our return from the north a few months later, Mendonça treated us with the greatest kindness and hospitality. He was not a philanthropist, and apparently looked upon his life in Africa as a weary exile. He tersely summed up his ideas concerning the natives and the country in a sentence which he often repeated to me: "negro diablo; Africa inferno"—(a black man is a devil; Africa is Hell). He had, however, many good qualities, but the evil surroundings amongst which he had lived, had exercised a deteriorating influence upon him. Whilst we were at Kassoko (the name of the island on which Mendonça lived) we met with a great misfortune, for three out of our four donkeys were killed by hyenas, and the fourth so torn as to be rendered useless for work. They were not on the island with us, but in a camp on the northern bank of the river in charge of my Basuto servant, and two Batongas. We were now reduced to five boys to carry our baggage. However, we had little baggage to carry. All our provisions were finished, and Mendonça had nothing to sell us, so that from this time forth, until we reached Matabeleland in the following May, we had nothing in the way of food but what we shot, and what we could buy from the natives, and nothing but water to drink. As we learned from Mendonça that elephants were plentiful on the Upper Kafukwe, I determined to set out there at once. Some natives that were consulted said we had best first cross the Manica plateau (not to

be confounded with the Manica country, in South Eastern Africa) to Sitanda's, the head chief of that district, and then get men from him to show us where the elephants were. The rainy season was just setting in—and it proved one of exceptional severity—we had neither tent nor waterproof, and only the most meagre outfit in the way of blankets and clothing, very little medicine, and nothing in the way of food but what we got from day to day. As long as we kept our health, however, everything went well. I shot game, and with the meat we bought whatever food the natives had to sell. But when we were all down with fever, and I could no longer shoot, we were very nearly starved, and altogether had such a bad time of it that we only just managed to live through that rainy season in Central Africa.

On December 13th we left Kassoko, Mendonça having supplemented our own five boys with four Shakundas who were to act as guides as far as Sitanda's. We crossed the Zambesi just below its junction with the Kafukwe, and at once made for the range of mountains which here runs parallel with the course of the Kafukwe and Zambesi Rivers, and beyond which lies the plateau of Manica. As a great deal of rain was now falling day and night, it was not until the fourth day after leaving the Zambesi valley that we at length emerged from the hills and stepped on to the table-land beyond; great open plains, or rather rolling downs, intersected by ranges of low hills, for all the world like portions of the Mashona country south of the Zambesi. I think we must have ascended quite 3000 feet above the level of the Zambesi. The temperature was delightfully pleasant, and quite fresh and cool after the sultry heat we had experienced since leaving Panda-matenka; the thermometer showed a difference of 20°. At the time of our visit to the Manica plateau the country looked charming. The young grass, thanks to the recent heavy rain, had shot up 1 foot or 18 inches in height over hill and dale, every tree and shrub was in full leaf, and everything looked green, and fresh, and smiling. Many of the shrubs on the edge of the hills bore sweet-smelling flowers, and, as on all the plateaus of the interior of Africa, small but beautiful ground-flowers were very abundant.

After reaching the plateau we travelled to the north-west, crossing the heads of the Mai-yuni and Chongwe Rivers, which flow first northwards, then eastwards, and finally southwards into the Zambesi. On January 1st, 1878, we reached a rivulet called Kalolo, which ran to the south-west towards the Kafukwe, and from this point to Sitanda's village we travelled nearly due north. The country near Sitanda's is no longer open, but consists of patches of open forest alternating with grassy valleys. Just beyond the village there is a large river or swamp, which the natives said it would take more than a day to cross. As, however, rain had been falling unceasingly for more than a month, almost every valley in the country was flooded. In these swamps of the Lukanga,

large herds of the graceful Lechwe antelopes were to be seen in all directions, standing up to their bellies in water, on the flooded land.

During our journey from the Zambesi to the Lukanga we had suffered much from exposure to the unceasing rain, and directly we halted my companion was laid up with fever. Then Franz, my Basuto servant, got an attack. At this time the struggle for existence was very severe, as there was a famine in Sitanda's country, and the people would only sell corn for meat. The only game to be got were Lechwe antelopes, in the swamps of the Lukanga, and I think it was the continual wading under a tropical sun that at last gave me fever too. Luckily I had laid up a good supply of corn before falling ill. When we were all ill Sitanda became most inhospitable, and, no doubt, was very much disappointed that we did not die and enable him to become our residuary legatee. The only thing for us now to do was to get back to the Zambesi. As soon as I shook off the fever I began to get strong again, and so also did Franz, but Mr. Owen remained in a very weak condition, and could only travel very slowly, and, as we only had a little calico left with which to buy food, and knew that when that was done we should starve to death, I at last took three of our five boys and pushed on to the Zambesi in order to send assistance back to my companion, with whom I left almost all the calico.

On February 19th I reached Mendonça's island, Kassoko, and was very kindly received, and on the following day sent assistance to my companion, who finally rejoined me on March 5th.

On March 21st, Mr. Owen seeming much stronger, we started for Matabeleland, intending to cross the Zambesi to the west of Kariba, and then strike due south, through an entirely unknown and pathless country. Soon after leaving Kassoko Mr. Owen got a bad relapse, and became so weak that he could not walk a step. I then made a kind of hammock of bark, and slung it on a pole, and, having obtained a supply of calico and powder from Mendonça, hired some Banyai to carry him. On April 4th we recrossed the Zambesi to the southern side. The daily worry and trouble I had to get the men to carry my companion can never be understood by anyone who has not had a similar experience. The anxiety of mind and want of sleep soon brought on fever; and though at first I only got an attack every second day, I presently had ague and fever every day, but was forced to walk on in the hot sun with the fever on me. Add to this, that we were travelling through a pathless country, and that, being the end of the rainy season, the vegetation was at its rankest, and I do not know how the journey could have been rendered more arduous.

At last, on April 15th, we reached a Banyai town on the Gweo, a tributary of the River Umay; and further than this the men from the Zambesi would not carry my companion; and as he could not walk a step, we were in a mess. We had only five boys, three of them mere

striplings, and, worst of all, but two and a half pieces of calico left. I myself was very weak and ill. Bad and insufficient food, overfatigue, and worry of mind had worn me out. There was but one thing to do, which was for me to push on to the Matabele country, and send help back as quickly as possible. In my weak state I almost despaired of being able to walk so far; but it was the only chance, for there was nothing left with which to pay men to carry Mr. Owen any further, and we were still a long, long way from the Matabele country. Arrangements were soon made. I left Franz, my Basuto servant, and a small boy, to carry wood and water, and took the other five Kafirs with me. I took nine yards of calico, leaving the two whole pieces and all the beads with Mr. Owen, which was a sufficient supply to enable him, with a little economy, to buy food enough to last at least six weeks, by which time, if I lived, help would have reached him from Matabeleland.

On April 17th I parted with Mr. Owen, and on May 4th reached Emhlangen, in Matabeleland, after a dreadful journey. In Matabeleland I was once more amongst my friends and countrymen, the missionaries and traders. A party was at once organised, and sent to Mr. Owen's assistance, and he eventually reached Bulawayo in better health than when I left him, as he had enjoyed a long rest.

By the following July I had quite recovered my health, and early in August started on an elephant-hunting expedition to northern Mashonaland, where I remained until the end of the year. On returning from this expedition, we (George Wood, Alfred Cross, Matthew Clarkson, and myself) cut a new road from the Umfuli to the Sebakwe River, as the old hunting-road to the north of the Machabi range of hills had become impracticable for waggons. Our new road traversed a beautiful stretch of high-lying, open, and well-watered country between the Machabi and Intaba Insimbi ranges of hills, and after this date, and prior to 1890, was the road always followed by hunters and travellers visiting Mashonaland.

In 1879 I travelled and hunted all over the country between the Mababi, Machabi, and Chobe (or Kwando) Rivers as far as Mai-ini's, where the river divides into two main branches, between which is a large island full of swamps and lagoons, where, at the time of our visit, game was very plentiful, especially buffaloes and Lechwe antelopes. In travelling to the Mababi River I took the desert road from Khama's capital, Shoshong, and our unfortunate cattle suffered much from want of water; in fact, our expedition narrowly escaped total destruction from thirst, for, on the last stage of the journey, the oxen had to pull the heavy waggons from the pool of Sode-Garra to the Mababi River—a distance of 120 miles—without a drink or a rest.

Mr. Arnot has described his journey over this same road three years later as a very arduous one; but he then found water in many places which were dry in 1879. During this year I crossed the Quando, and

visited the site of Linyanti, the chief town of the Makololo chief, Sebituane, who was visited by Livingstone and Oswell in 1852. At that time Sebituane was lord over a vast extent of country, and his warriors had conquered the Barotsi, on the Upper Zambesi, and devastated the whole of the high plateau lying between that river and the Kafukwe. At length Sebituane died, and his son, Sekeletu, became king in his stead. He also was the friend of Livingstone, by whom he was visited for the last time in 1861. When Sekeletu died, the Makololo empire fell to pieces. There was a civil war between two rival claimants for the chieftainship; and then the subject tribes rose upon their conquerors, and, led by Sipopo, a descendant of the old Barotsi chiefs who had ruled in the land before the Makololo invasion, utterly annihilated the remnant of the conquering race. Every male child was slain, but the females were taken as wives; so that there is a strong strain of Makololo blood amongst the present Barotsi people. Two small parties of Makololo warriors escaped the general slaughter, and fled across the Kwando. One of these parties made their way to, and craved protection from, Lechulatebe, the chief of the Batawani, at Lake Ngami, by whom they were treacherously murdered to a man. The second party went to Matabeleland, and were well received by Umziligazi, who gave them cattle and land to live upon; so that they thrived and prospered, and their descendants are living in the country to the present day. At the time of our visit to Linyanti nothing remained to show its former prosperity but the site of an old native town. Where fifteen years previously cattle had grazed, and human beings had tilled the soil, we found great herds of buffaloes and Lechwe antelopes; and in all the land, to use a native expression, "there were no lords but the lions." With the buffaloes had come the tse-tse fly, and we found these insects very numerous in the district. We visited the graves of Sebituane and Sekeletu, and our Kafirs made offerings, and prayed to the spirits of these departed chiefs. Their pale ghosts, however, frowned upon us, for not only did we not see many elephants, which we had prayed to be put in the way of seeing, but my unfortunate friend Mr. French lost himself, and died of thirst in the desert country between the Chobe and the Zambesi. At Linyanti we found the tires and nave-bands of a waggon that had long since crumbled to decay. This waggon may have belonged to Dr. Livingstone, or to the unfortunate mission party who, with their wives and children, all died here in 1861, with the exception of Mr. Price and two of Mr. Helmore's children.

During this year I noticed more particularly than in 1874 the curious phenomenon of the steady rise of the waters of the Chobe and Machabi—an outlet of the Okavango—from the first week in June until the last week in September, when they commenced to recede. That the Okavango and the Upper Kwando are connected on their upper courses, I think there can be no doubt, as the waters of the Machabi

went on rising steadily *pari passu* with the Chobe, until the end of September, when both commenced to recede simultaneously.

What is the explanation of this remarkable phenomenon I am still at a loss to conceive, as there are no snow mountains at the sources of the Kwando and Okavango Rivers, and the Zambesi, which rises in the same latitude, decreases steadily in volume from day to day during the dry season like all other rivers with which I am acquainted in South Central Africa. Besides the channels which still become annually filled with water from the overflow of the Chobe and Okavango river systems, there are many others which are now quite dry, but in which the natives say they once used to travel in canoes. Further to the south-east too, in the country between the Gowai and Nata Rivers, there are old river-beds, some of which are quite dry, whilst in others pools of water may still be found; and where such pools exist they are either permanent, or water may be obtained by digging when they are dry, which seems to show that water still runs in these ancient river-beds below the surface.

In the following year, 1880, I again visited Mashonaland on a hunting expedition in company with Mr. J. S. Jameson, who recently lost his life under such very sad circumstances, when left behind on the Congo during the progress of the Emin Relief Expedition. Poor Jameson and I lived together for a year in the wilderness, and I have never yet met a more lovable man. He was a very keen sportsman, and full of life and spirits, and being both gentle and brave, was a universal favourite, not only with all sorts and conditions of white men, whether Boer hunters or English traders, but also with the natives, from Lo Bengula downwards. During the year we traced the course of the Umfuli River to its junction with the Sanyati, proving conclusively that it did not run into the Zambesi independently, as represented on all the maps published up to this date.

In 1881 I returned to England for the second time.

In 1882 I again revisited Mashonaland. At that time the topographical features of a very large area of what we now call Mashonaland were entirely unknown to geographers. The well-known and pains-taking traveller, Mr. Thomas Baines, had never penetrated beyond the River Manyami (or Hanyani), and although my friends, Messrs. George Westbeeck and G. A. Phillips had accompanied a Matabeli impi to the sources of the Mazoe in 1868, they had not plotted their route, or published any notes of their journey. Farther south Herr Karl Mauch, the indefatigable German traveller and mineralogist, after discovering the ancient temple of Zimbabwe (Zimbab-ghi), had made a most notable journey past Mount Wedza, near the head waters of the Sabi, and from thence, passing through Mangwendi's country and down the valley of the Ruenya (or Inyangombi River) had reached the Lower Zambesi at Sena. Still this was a single journey, and the country on each side of Mauch's

route was very incorrectly laid down in the best maps. During 1882, 1883, 1885, 1887, 1889, 1890, 1891 and 1892 I have been constantly travelling over almost every portion of the Mashona plateau, and during that time have been constantly mapping out the country in a rough way by taking compass bearings wherever possible from hill to hill, and by sketching the courses of the innumerable rivers and streams from the tops of the hills. This work can be done much better during the rainy season than at any other time, as after the first grass fires the air becomes so thick that it is impossible to take compass bearings. During 1882 I made a journey from the plateau to the Zambesi, first following the line of the Umvukwe hills to the north, and then working down the valley of the Umsengaisi River. After striking the Zambesi, I followed its course westwards to Zumbo, and found that the Panyami River flows into the Zambesi some 15 miles east of Zumbo, instead of to the west of that place as it was always marked in the maps previous to the time of my visit. I returned to the plateau by the valleys of the Panyami and Angwa Rivers. In 1889 I penetrated to the plateau from Tete on the Zambesi, and during this journey I traced the Mazoe River to its source, which I found to be very far from where it was laid down in the maps. In 1891 I made a journey down the Revue to near its junction with the Buzi, and a few months later crossed the former river near Vumbi's town, and examined the country between the Pungwe and Buzi Rivers in order to try and find a route for a waggon road to the lower Pungwe, which would be free from tse-tse fly. In this I was unsuccessful, as I found all the low-lying country infested with this destructive insect.

I have now briefly referred to some of my journeys from the high plateau of Mashonaland to the countries which surround it to the north-east and south; but my ramblings over the plateau itself have been so numerous and ubiquitous, extending as they do over the greater portion of eight years (during the whole of which time I was continually on the move, and seldom slept twice in the same place), that it would be impossible for me to give any detailed account of them. My map, when published, will speak for itself, and show that I have made a careful survey of a large area of country. I have climbed almost every hill, and taken hundreds of compass bearings, sketching-in the courses of the rivers and streams from the tops of the hills. Besides an intimate knowledge of the geographical features of the country, I have learned, too, something of the history of the native races by whom it is inhabited; and I have visited the ancient temple of Zimbabghi, and carefully examined many of the walled towns in the territories of Makoni and Mangwendi. I have my ideas, too, as to the suitability of the climate of Mashonaland for Europeans, the general capabilities of the country, and its future possibilities, and on all these matters I will now proceed to say a few words.

To begin with, the name Mashonaland is a coined word, and how it became current I have never been able to discover. The native inhabitants of this part of Africa belong to many different clans, some of which are probably the remnants of once powerful tribes. Each sept has its own tribal name and tribal marks, and the territory of each is fairly well defined. Thus, Motoko's people are Mabuja; Makoni's tribe Ma-ongwe; Umtasa's, Mabocha; Mangwendi's, Muzizuru, etc. I have never, however, met with any clan whose members called themselves Mashonas; and the name is altogether unknown amongst the natives of this part of Africa, except to a few who have learnt the word from Europeans. As a generic term, however, the word is useful, and may be taken to designate all the tribes of South-Eastern Africa that are not of Zulu blood. These tribes, it may be remarked, all speak dialects differing very slightly one from another, and all of them quite comprehensible to the Makalakas living to the west and south-west of Matabeleland. In speaking of Mashonas and Mashonaland, I may mention that in an article written by me, and published in the *Fortnightly Review* for May, 1889, I expressed the same views concerning the origin of these words which I now repeat. In his paper, published in your *Proceedings* in the May number for 1892, Mr. Bent refers to this subject, and has an uncomplimentary remark about "certain pioneers with their usual perversity," etc., giving wrong names. I believe he had no knowledge of any native dialect, and had only spent a few weeks in the country, while some of the pioneers to whom he refers had spent years. He tells us that all the inhabitants of Mashonaland call themselves Makalanga, and that the country ought to be called Makalanga Land. In support of his contention he adduces the fact that four hundred years earlier Dos Santos found a people called Mokarangas in South-Eastern Africa.

Very likely, but Dos Santos never travelled in the country to the west of the Sabi, where Mr. Bent avers all the people now call themselves Makalangas, and where Dos Santos did travel there are certainly no Mokaranga, Makalanga, or Bakalanga. Possibly the Bakalanga, whom Mr. Theal found living in Basutoland during the present century, are the descendants of the Mokaranga, amongst whom Dos Santos travelled four centuries ago. The explanation of Mr. Bent's mistake is very simple. He had a Matabele boy who acted as interpreter between his white interpreter and the Mashonas. This Matabele called all septs of Mashonas Makalanga, using the word to denote an inferior people. Mr. Bent, too, tells us that Makalanga means people of the sun. Originally no doubt it did, but in the mouth of a Matabele I do not think it has that meaning, it being the Zulu corruption of the word Makalaka, as the people living to the west of Matabeleland call themselves. The Matabele call these people Ama Kalanga, and I know of no other people who call themselves either Makalaka or Makalanga. I

may be wrong, but this is not only my opinion, but also that of Fathers Prestige and Hartmann (S.J.) who speak the Mashona dialect, and have made many inquiries amongst the natives on the subject.

There being a considerable amount of uncertainty as to the number of tribes that may legitimately be classed under the generic term of Mashonas, there is naturally some doubt as to the actual extent of the territory that ought to be called Mashonaland. In former days we used to speak of the whole of the plateau to the east, north-east and south-east of Matabeleland as Mashonaland; but a name is wanted which will include Matabeleland and Manicaland, and in fact take in the whole of the British South Africa Company's territories. Zambesia and Rhodesia are the only two names that I have heard suggested, and the latter, which has been given out of compliment to Mr. Cecil Rhodes, to whom alone it is due, that what may soon become a rich and prosperous territory has been added to the British dominions (practically I think it is so), seems to be steadily gaining ground in popular favour; as the two papers published in Mashonaland are called respectively the *Rhodesia Herald* and the *Rhodesia Chronicle*.

People who hurry through the country, and especially those who do not go beyond Salisbury, have but little idea of the extent of the high plateau of Mashonaland. Stretching away to the east and south-east of the main road between Salisbury and Umtali, there is a very fine tract of country, which is but very little known. In this direction I have travelled a good deal, and made a careful survey, a glance at which will show how magnificently watered is this part of the country. Portions of this district, especially in the neighbourhood of the sources of the Rusapi River, and its numerous tributaries, are remarkable for the abundance of huge naked masses of granite, which rise abruptly from the grassy downs. Some of these, though formed of a single block of stone, are worthy to be called hills; notably the huge cone, named Dombo, which, standing as it does, on the extreme eastern edge of Mashonaland, commands a truly magnificent panoramic view over an immense extent of country; for the plateau itself, on the edge of which Dombo stands, here attains a height of 6000 feet; and whoever climbs this naked crag will stand 6700 feet above the sea, perhaps the highest point in South-eastern Africa; for I doubt much whether the loftiest hills in Manica attain a height of 7000 feet.

It was in February 1891, during the height of the rainy season, that after two attempts, rendered unsuccessful by blinding storms of rain (during one of which my companion, Mr. W. L. Armstrong, was nearly washed down a fissure in the mountain side), we stood at last, compass in hand, on the summit of Dombo. Well indeed were we repaid for our perseverance. The air, freed by months of rain from the smoke of the winter grass fires, was extraordinarily clear, and enabled us to see, at one and the same time, several of the most conspicuous hills in Mashonaland;

the peaks of Wedza far in the west; the great table mountain of Inyarugwe, away down in Maranka's country, near the Sabi River; the granite cone of Temwa, which stands far to the north-east, near Motoko's stronghold; besides Mount Anwa, beyond the sources of the Masheke, and many another well-known hill. Stretching away to the north-east lay the great mountain range of Inyama, culminating in a conspicuous peak, which may, possibly, be the Mount Bismarck of Mauch; while to the south lay a wilderness of rugged mountains, which form a portion of the wild and beautiful land of Manica. Amidst the gorges of these mountains two important rivers take their rise: the swift and impetuous Odzi, one of the main tributaries of the Sabi, and the equally swift, and much more important river, the Ruenya, loved of hippopotami, which, after receiving the waters of almost every river in Eastern Mashonaland, south of the Umvukwe range of hills, pours the impetuous waters of a mountain torrent, clear and cool to the very end of its career, into the giant Zambesi. The upper course of the Ruenya is called the Imyang-ombi (Yankombe of Mauch), and from the top of Dombo it may be seen for many miles, winding like a silver thread (by-the-bye, I think I have heard that simile before) down the valley, running parallel with the Inyama Mountains.

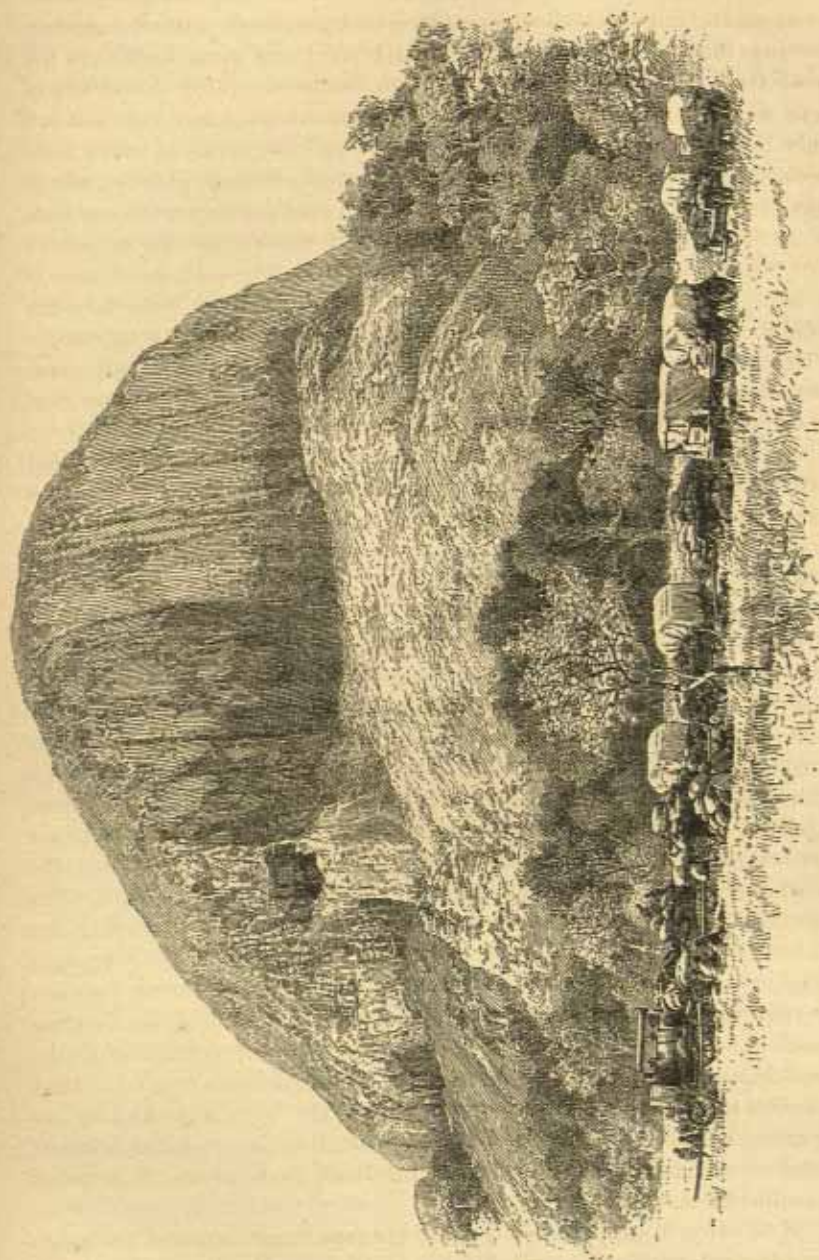
Although Dombo, viewed from a distance, looks like a uniformly smooth-rounded cone of granite 700 feet in height, a close inspection shows that in places deep furrows have been worn in its sides by the action of rain. This phenomenon may be seen in many of the higher granite crags of Mashonaland, but nowhere to such perfection as on the western face of a large isolated hill called Zomba, which stands near the head waters of the little River Inyazuri. This hill stands within half a mile of the main road, between Fort Salisbury and Manica, and cannot fail to attract the attention of any passers-by for whom the operations of nature have any interest. The centre of the western face of the solid granite rock has been scored and furrowed in such a way, that it presents the appearance of a water-worn glacier, and the depth of the furrows must be measured not by inches, but by feet and yards. Now imagine what this means. This hill is a bare granite crag; perfectly isolated, and the only possible agency that can have scored its sides is rain. Yet the effect produced by the showers, which actually fall upon it, during ten years, or even a century's wet seasons, must be so infinitely small, that countless eons of time must have elapsed since this old rock first bared its face to wind and storm.

Judged by our calculation of time, what a very old world this planet must be, for all this erosion of hard rock by rain must have occurred subsequently to the last elevation of this portion of the Earth's crust, as except on the supposition that all this part of Africa was once submerged, I cannot understand how the curious kopjes of wonderfully-balanced granite stones, which are so remarkable a feature in the landscapes of

many portions of South-Eastern Africa, can have been formed. As the land slowly rose, I take it that the soil was washed by the water from amongst the huge loose boulders which had previously drifted together, leaving them at last high and dry, and piled one upon another in the most fantastic confusion. Other single blocks weighing hundreds of tons may be seen standing singly on the slope of a granite hill, and can only have been brought there by water, just as blocks of stone have been left stranded in various parts of Europe by ancient glaciers, which have long since disappeared. I think I have read somewhere that Africa is geologically a very old continent, and I think that the rain-worn furrows in the granite rocks I have above alluded to are a proof that it is so; and what is more, the hippopotamus paths worn deep into the solid rock along the lower Umtali River—paths formed in the hard stone with the central ridge plainly shown, as in a hippopotamus path made but yesterday in muddy ground—prove that the mammals existing in it at the present day have roamed the land for countless ages.

As regards the native races inhabiting Mashonaland at the present day, they seem to be much the same as they were in the time of Dos Santos four centuries ago. They belong to the Bantu family, which is spread over the whole of south-eastern and south-central Africa; but what the Bantus are ethnologically, who can say? They are certainly not a pure race, though the negro blood predominates in them. The infusion of foreign blood which undoubtedly runs in their veins must have come from a lighter-skinned people, I fancy, for I have noticed that in all tribes of Kafirs, amongst whom I have travelled, good features, thin lips, and well-shaped heads, are almost invariably correlated with a light-coloured skin. Now I will here hazard a theory which may or may not have any foundation in fact. I will first, however, assume that Mr. Bent is correct in the supposition that the original builders of Zimbabwe came from southern Arabia. Dr. Schlichter, in a criticism upon Mr. Bent's lately published book, 'The Ruined Cities of Mashonaland,' proves conclusively that during the six centuries which elapsed between the founding of the Christian religion and the birth of Mohammed there was no intercourse between the natives of Southern Arabia and South-eastern Africa, so that we must put back to a very remote period the first incursion of the worshippers of Baal into the country we now call Mashonaland. That the builders of Zimbabwe were a very rude people possessing no written characters and doing all their building by eye and without measurement, is, I think, abundantly evident from an examination of the ruins themselves.

Well, we will suppose that two or perhaps three thousand years ago a commercial people penetrated from Southern Arabia to Mashonaland. They were acquainted with the requirements of the civilised nations of Asia at that period and understood the value of gold. This metal



A KOPJE.

they discovered amongst the hills and in the streams of Mashonaland. In time these Arabian merchants gained a footing in the land and taught the black aborigines to mine for them. Their principal station was at Zimbabwe, where they built, with the forced labour of the aborigines, a temple for the worship of Baal, and a strongly-built and well-situated fortress. But I take it, that, like the Arabs in Central Africa at the present day, these ancient Arabians brought few or no women with them, but took a very handsome allowance of wives from amongst the aboriginal blacks. For a long period intercourse was kept up with Arabia, and during this period the gold-seekers spread over the whole of South-eastern Africa from the Zambesi to the Limpopo, everywhere mixing with the people, and teaching them their own rude arts of wall-building and gold-mining. In course of time, we will suppose, that events happened in Arabia which put an end to all intercourse with the distant colony in Mashonaland, and as time went on, as the alien race were still in small numbers, compared with the aboriginal blacks, and as they had none of their own women with them, they gradually became completely fused, and nationally lost amongst the aborigines. The mixed race called the Bantu had been formed, which spread in course of time northwards as far as the Congo, and southwards as far as the Cape Colony, or the migrations may first have been northwards and then again southwards down the east coast, with an admixture of other tribes, such as the Zends, spoken of by El Massoudi. At any rate I am absolutely convinced that the blood of the ancient builders of Zimbabwe still runs (in a very diluted form if you like) in the veins of the Bantu races, and more especially so amongst the remnants of the tribes still living in Mashonaland, and the Barotsi of the Upper Zambesi, who are, there is little doubt, a branch of the Barotsi tribe who were destroyed by the Matabele, though the separation took place long prior to this event.

I make this statement after much thought, a close study of the relics unearthed at Zimbabwe, and a knowledge of the natives of South-eastern Africa gained during many years of travel. There is no impassable gulf between a highly-civilised race and an utterly savage one, as some people would have us believe. Many things tend to prove that the ancient builders of Zimbabwe were a very rude people. They were sufficiently imaginative to have a religion, and possessed sufficient energy and concentration of purpose to carry to an end the immense work of building the temple of Zimbabwe. But the work itself, though very wonderful, is rude and unsymmetrical. Nowhere is the wall absolutely plumb, and on the top it varies considerably in breadth. The fact that no written characters have been found on any of the flat granite or soapstone beams imbedded in the walls, or the large flat stones standing upright like tombstones in the floor of the Zimbabwe, seems to me to prove that the people who built this temple were

unacquainted with writing of any kind. The only carvings on the sides of the soapstone beams are lozenge-shaped and herring-bone patterns (badly carved, not a single line being quite straight), agreeing exactly in some cases with the ornamentation on the outside of the temple; and more curious still, not alone with the patterns carved on the wooden knife sheaths, and scored on the pottery of the natives all over Mashonaland, but also with the patterns used in ornamenting the household utensils of all kinds in the Barotsi Valley hundreds of miles away.

In asserting that no sign of any written character has been found at Zimbabwe, I am aware that I am ignoring the small piece of soapstone brought home by Mr. Bent, with some marks scratched upon it. I do this advisedly, because I believe (and I am not alone in the belief) that these marks are quite modern. However, the stone, which is now in the South African Museum at Cape Town, may be examined under a magnifying glass. To me the scratches certainly seemed quite fresh, when I examined it at the late Kimberley Exhibition. The most curious relics that have been found at Zimbabwe are, undoubtedly, the birds carved sitting on the tops of the soapstone beams; these bear no resemblance to anything now seen amongst the Bantu people, and were doubtless connected with the ancient worship. Not so, however, the carvings on the soapstone bowls. These are very rude, so much so that the animals that have been taken by Mr. Bent to represent hippopotami, I take to be meant for baboons, as they have long tails. But the curious thing about these bas-reliefs is the close resemblance they bear to the wooden carvings of animals to be seen amongst the Bantu people at the present day. The genius of the ancient artists still lives amongst them.

Mr. Bent speaks of the "ruined cities" of Mashonaland. What trace of them is there, I would ask? I have seen the temple of Zimbabwe and some smaller ones, the fortress on the hill near the large temple, and further, many hundreds or thousands of stone walls in various parts of South-eastern Africa, but never a trace of a city built of stone. There is strong presumptive evidence that the structures which the people lived in near the great temple were huts plastered with mud. For this reason: at the foot of the hill on which stands the fortress are two immense holes dug in the ground. I have heard the theory advanced that these holes were used as reservoirs for water; but I take them to be merely the holes excavated by the people living on the hill, to obtain clay for their pottery and with which to daub their huts. The native population was large and endured for a long period of time; therefore the excavations are larger than those found at the side of any Bantu village at the present day; but, wherever there is a village, or the site of a deserted village, a similar hole, larger or smaller in proportion to the size of the town and the length of its duration, will always be found.

As to the relations of the ancient builders of the temple of Zimbabwe to the present inhabitants of the country. On my theory the blood of the ancient worshippers of Baal still runs in their veins; very much diluted, no doubt, but still in sufficient strength to occasionally produce amongst them men with light-brown skins and high features, and sometimes of great intellectual power. After a certain lapse of time, when the higher race had become entirely fused and practically lost amongst the lower and more numerous aboriginal people, the worship of Baal died out, and was superseded by the old religion of ancestor worship which still prevails; but I maintain that the wall-building and gold-mining, originally learnt from the ancient Arabians, were carried on continuously from the first inception up to the middle of the present century. It is the Zulu migrations northwards through Mashonaland which have taken place during the present century (invasions which have absolutely depopulated large areas of country) that finally obliged the Mashonas to cease working in the shafts which their ancestors had centuries before commenced to sink on the quartz reefs which abound in the country. As the mining had been carried on for a long period of time, naturally an enormous amount of work had been done in the aggregate, some of the shafts recently discovered in Mashonaland being as much as 120 feet in depth. But I cannot dwell on the subject here. Many people seem to imagine that an ancient race once existed in Mashonaland, who built temples and cities and did an immense amount of work in the way of gold-mining. This race, they say, was destroyed by the ancestors of the present inhabitants of the country, and the gold industry then ceased until the advent of the Portuguese, by whom it was again revived. It is this idea which I wish to combat. When the Portuguese arrived in South-Eastern Africa at the close of the fifteenth century, they found Arab settlements on the coast, and first learned from the Arabs of the gold mines in the interior of the country. These gold mines were being worked by the natives of the country, who used the gold as a medium of exchange, to buy the goods brought to them by the Arabs, and for centuries before this time their ancestors had in all probability made use of gold, whose value had been first taught them by the ancient builders of the temple of Zimbabwe to trade with the commercial peoples of the East who from time to time penetrated to Mashonaland. Thus, when the Arabs were driven from South-Eastern Africa the mining did not cease, as the natives simply sold their gold to the newcomers, whom they probably found even more anxious to obtain the metal than the Arab merchants had been.

After this period Portuguese records abundantly prove that the gold mining went on without interruption till early in the present century, and the old men amongst the Matabele, who took part in the first raids made amongst the Mashonas by Umziligazi's warriors, state positively

that they found the Amacholi working for gold in the "Amaguti,"—i.e., "in the deep holes" between the Zweswe and Umfuli Rivers. An interesting confirmation of this statement lies in the fact that at the bottom of an old shaft, 120 feet deep, at Concession Hill, near the Zweswe River, Mr. Cock, in 1891, found a bucket and rope made of "Machabel" bark, besides some iron implements. Now this bucket and rope, evidently intended to haul quartz up with from the bottom of the shaft, being made of such perishable material as bark, could not possibly be of any great antiquity, whilst the iron implements, axes, etc., were absolutely the same as those in present use amongst the Mashonas, and showed no signs of age. Mr. Rolker, the American mining expert, lately in Mashonaland, also told me that from the condition of the heaps of *débris* at the mouths of some of the shafts, he was convinced they had not been long abandoned. And if my readers will turn to Mr. Baines' well-known book on the gold regions of South-eastern Africa they will find that the Mashonas were still little more than twenty years ago getting quartz from the reefs, which they roasted in great fires, and then pounded up with round stones in order to extract the gold. The passage I refer to reads as follows:—

"G. Wood took me to a place in which he had seen a heap of quartz burned, and another heap, piled with wood among it, ready for burning. The crushing stones, like a printer's slab and muller, had also been lying in a hut near, but at the time of my visit these were removed, and the calcined quartz also; but the other heap had been fired, and now lay mingled with the charcoal ready for crushing."

The Mr. George Wood here referred to was my constant companion for two years, and he often used to tell me how he had seen the Mashonas extracting gold from quartz; and he further told me that, after crushing the roasted quartz, they used to melt the gold into little ingots in small crucibles made for the purpose. There is nothing to be surprised at in this, as both the Mashonas and Makalakas still extract copper from the ore and run it into moulds, whilst in Katanga the form of the mould into which the natives run their copper is almost identical in shape with the soapstone mould found by Mr. Bent at Zimbabwe. Before quitting the subject of the ancient mining, there is one other fact which I will adduce as evidence that gold mining was carried on by the natives up to a comparatively recent date in South-eastern Africa, I was at Tati, in South-western Matabeleland, some years ago, when Mr. S. H. Edwards discovered an old shaft, and I examined it carefully in his company. At the mouth of the shaft was a heap of *débris*, on which a small tree was growing, about 4 inches in diameter, and, just beyond, a stack of roasted quartz, ready for crushing, and several peculiar round stones, of a kind that we had never seen in the district, intended to be used in grinding the quartz. The quartz vein itself had been about 5 feet broad on the surface of the ground, and

dipped at an angle of about forty-five degrees, going down in the shape of a wedge and becoming thinner and thinner, until at the lowest point where the work had stopped, it was not more than 18 inches thick, and the quartz at this depth could only have been extracted most laboriously by a man lying head downwards and picking at it. The *modus operandi* had probably been to first light fires against the face of the quartz to soften it before picking it out, as, where the work had been abandoned, the quartz was burnt black by fire. But the most remarkable thing about this shaft was the fact that, at its upper end, the roof was supported by about ten logs of Mopani* wood. At that time I had never seen a gold mine; but lately I have seen mines in Johannesburg with portions of the roof supported in precisely the same manner as in the old shaft at Tati. We knocked all these supports out, and Mr. Edwards and I examined them one and all very carefully. They had all been chopped with the same kind of narrow-edged axes used by the natives at the present day, whilst all of them were still covered with bark, and, in fact, were in such good condition that they could not have been very ancient. I imagine that this shaft was abandoned, together with others in the district, at the time when Umziligazi first took possession of Matabeleland, in about 1840. So much for the gold-mining in Mashonaland; now for the wall building.

I maintain that, so far from there having been an abrupt transition from a people who built the temple of Zimbabwe to a race who never put one stone upon another, the inhabitants of Makoni's and Mangwendi's countries in South-eastern Mashonaland, only ceased to surround their towns with well-built stone walls during the last generation, when they found that these walls offered but an inefficient protection against the Zulu hordes of Manikos, and his son, Umzila, by whom their country has been continually ravaged during the present century. The more ancient the towns appear to be, however, the better, speaking generally, they have been built; and in Makoni's country, at any rate, there is clear evidence that there has been a gradual deterioration from a people who were capable of building walls which will compare with any part of the great Zimbabwe, to the very inferior hut-building barbarians of the present day. Makoni's† town as it now stands is a monument of filth and uncleanness, and is undefended by anything but a small fence. His old town which I also visited, and from which I believe he was driven by Umtasa, was surrounded by a moat and a loopholed mud wall, whilst the town, which it is said was built by his ancestor, Chipadzi, was surrounded by a well-built, loopholed stone wall. This is one of the best old walled towns I have seen. I visited it for the first time in October, 1890, and again last year. There are

* This is the common wood of the district.

† Father of the present chief.

many other walled towns in the district, some of them reminding one strongly of the fortress on the hill at Zimbabwe.

Let me here make an extract from my diary, bearing date October 19th, 1890. "On that day I left Makoni's and passed some very curious old ruins. First, there was a hill on which were built several concentric walls and the stone foundations of round huts, the whole being surrounded by a moat. A little further on, there was a small kopje composed of a few large blocks of granite, some of which were piled up in the centre in the form of a tower. The whole of this kopje was enclosed by a very well-built wall about 200 yards in circumference, 8 feet in thickness, and 10 feet in height. The stones composing this wall have the appearance of having been cemented together with mud, which is the first time I have ever noticed anything of the kind



THE SELOUS ROAD, MASHONALAND.

in South-eastern Africa. Through this wall there were four entrances, apertures about 4 feet in height, and $2\frac{1}{2}$ feet in breadth. These apertures were let into the base of the wall, and were roofed over with large flat slabs of granite. Inside this wall were the foundations of numerous round buildings. These foundations were all very well built of closely fitted pieces of squared granite, and were about 18 inches in depth. The huts that were built upon them must have been at least four times the size of the huts used by the natives at the present day. Whilst speaking of these carefully fitted stone foundations on which to build huts, I may mention that in the centre of Umtasa's deserted town on the Chodzani River, a town which he built himself, and from which he was driven a few years ago by the Abagaza, will be found a similar hut foundation, very carefully built of small slabs of granite, beautifully fitted without mortar or cement, which proves that the art of building

walls of carefully fitted granite stones is not even yet dead amongst the Mashonas."

However, let me return to the walled town of Makoni's ancestor. Besides the four entrances into the stronghold, there were numerous small holes let into the wall, some of which may have served as loopholes through which archers discharged arrows, but others, from their position I judge to have been intended for drains to carry off water. This stronghold is said to have been built by Chipadzi, the ancient chief of all this part of the country and an ancestor of Makoni's. The name of the walled town is Chitiketi.

About half a mile from this old walled town was the burial-place of Chipadzi, one side of which was enclosed by a beautifully built wall about 10 feet high, of evenly laid and squared granite stones, most carefully fitted together without mortar or cement of any kind. This wall was an exact facsimile of the best built portions of the great Zimbabwe, and no one who has examined carefully both these relics of a bygone age, can doubt for an instant that they were both built by the same race of people. This place is the Zimbabwe or temple of Makoni's people, and is spoken of by them as "The Zimbabwe." Here in time of national trouble the chief slaughters cattle, and makes propitiatory offerings to the spirit of Chipadzi, and private individuals make offerings of goats, fowls, or pots of beer. Now there is no tower or indeed anything to make one believe that this Zimbabwe was ever connected with Phallic worship. It was probably built long after the great temple, when the Arabian element had become lost amongst the more numerous aboriginal race, and when the people had replaced the worship of Baal by the still older form of ancestor-worship.

The enclosure is probably simply the burial-place of Chipadzi, but the wall could not have been better built had it been the work of the actual builders of the great temple. I may here say that the word *Zimbabge* or *Zimbabghi* (the form used by the natives in the neighbourhood of the ruins) is in all probability derived from the words "umba" or "imba," a building, plural *zimba*, and "mubge," "stones," these words being used at the present day in Mashonaland. Thus *Zimbábge* means the "buildings of stones," and as there were no other buildings except grass thatched huts, came to have a special significance and may be best translated by the English word "Temple."

In the foregoing pages, I have endeavoured to show that there is no evidence that any high form of ancient civilisation ever existed in South-Eastern Africa at all, whilst many facts go to prove that the two industries or arts which are supposed by many to separate the ancient inhabitants of the country from the Bantu people living there at the present day, namely, gold-mining and wall-building, have only been abandoned very recently. The evidences of Phallic worship which have been discovered at the temple of Zimbabwe, give one a fair right

to suppose that the original builders of the temple came from a country where that form of worship is known to have been practised in very ancient times; but I do not believe that this foreign race, in its pure state, spread over the whole country between the Zambesi and the Limpopo, and did all the gold-mining and wall-building that has been done in that vast territory, and was then utterly destroyed and supplanted by a more barbarous people. The evidence available seems to me to be far stronger in favour of the theory which I have advanced of the gradual fusion of a numerically small number of a race of traders and merchants, who were themselves in a low state of civilisation, with the aboriginal inhabitants of the country. Thus alone can I account for many things; the long continuance and the gradual deterioration noticeable in the wall-building in Mashonaland; the ingrained inherited impulse which causes the Barotsi of the Upper Zambesi, who are an offshoot of the Barotsi of Mashonaland, to still carve the same chevron patterns on their pottery, on their knife-sheaths, and on their wooden pots and bowls, that the ancient worshippers of Baal represented in stone-work round the Temple of Zimbabwe and carved in soapstone hundreds or thousands of years ago. Add to this that the wooden bowls themselves still retain the same form as the ancient ones carved in soapstone; that the wooden carvings of animals made at the present day, and the rude bas-reliefs on the soapstone bowls are the products of the same school of art, and the fact that the Bantu races inhabiting Mashonaland and adjoining countries to-day are subject to atavism or reversion to a type of man, which is Asiatic or semitic rather than negroid, and it seems to me that only one theory is possible, which is that the ancient builders of Zimbabwe were not first destroyed and then supplanted by an inferior race, but that they became gradually fused with a lower race, which still bears traces of its admixture with the more intelligent people.

I will now say a few words concerning the history of Mashonaland in modern times, which I think will show, that it is not to be wondered at that the native races inhabiting that country should have abandoned some of their arts and industries, and become the timid and broken-spirited people which they now are.

As far as we can learn, the country we now call Mashonaland was in the early part of the present century ruled over by the ancestors of the petty chiefs Makoni, Mangwendi, Motoko Sosi, Umtasa, &c., who were the rulers of large and prosperous tribes, living in huts, the foundations of which, where they still exist, show them to have been at least three times the size of the miserable tenements which satisfy their degenerate descendants, and whose towns were, for the most part, surrounded by well-built and loopholed stone walls, many of which still remain in perfect preservation to-day, especially in the country of Makoni, the chief of the Ma-ongwe. Hundreds of thousands of acres

that now lie fallow must then have been under cultivation, as is proved by the traces of rice and maize fields, which can still be discerned in almost every valley, whilst the sites of ancient villages, long ago crumbled to decay, and now only marked by a few deep pits, from which the natives obtained the clay used by them in plastering their huts, are very numerous all over the open downs, where no stones were procurable with which to build walls round the towns. On almost every hill traces of the stone walls will be found which once encircled and protected ancient villages. At that time the inhabitants of this part of Africa must have been rich and prosperous, possessing large flocks of sheep and goats, and numerous herds of a small but beautiful breed of cattle. This state of things was not, however, destined to continue, for some twelve or fifteen years after the Cape of Good Hope became a British Colony, in 1806, some of the outlying Zulu clans broke away from the harsh and cruel rule of Chhaka and commenced their migrations northwards; and wherever these ferocious warriors went their track was marked by the flight of the vultures which feasted upon the corpses of the men, women, and children they had slain, and the flames of the villages they had set fire to. Manikos, the grandfather of Gungunyan, the present chief of the Aba-gaza, was the leader of one of these bands, whilst the ancestor of Pezen, the principal chief of the Angoni, who are now settled to the west of Lake Nyasa, led another horde. These two Zulu chiefs, after devastating a great portion of what is now called Mashonaland, both settled near the head-waters of the Sabi, where they soon came into collision with one another. A great battle was fought, lasting, so Bengula told me he had heard from old men of the Abagaza, for three days, at the end of which time the Angoni were defeated and driven from their settlements. They retreated northwards, devastating the whole country through which they passed, and crossing the Zambesi to the east of Zumbo, made their way on to the high plateau, which lies to the west of Lake Nyasa, where they are living at the present day, a scourge to all the surrounding tribes.

After the battle with the Angoni, the Abagaza retreated southwards and settled on an elevated and fertile tract of country to the east of the Central Sabi, and from that date, until a few years ago, they never ceased to devastate the southern and eastern portions of Mashonaland, their principal raiding grounds being in the countries of Mokoto, Mangwendi, Makoni, Sosi, and Makwirimba. In spite, however, of the devastations committed by the Angoni and the Abagaza, large portions of northern and western Mashonaland remained untroubled by the Zulu raids until about 1840. About this time the Amandebele, under their warlike chief, Umziligazi, being unable to hold their own against the Dutch Boers, who were then commencing to settle in the Transvaal, crossed the Limpopo, and travelling northwards, destroying as they went,

finally halted, and built permanent kraals in the country now known as Matabeleland, and soon well-disciplined bands of desperate savages men born and bred amidst the ceaseless slaughter of 'Chhaka's' never-ending wars, overran every portion of Mashonaland, which had up till then escaped the blood-stained assegais of the Angoni and the Abagaza. These oft-recurring raids upon the unwarlike inhabitants of Mashonaland, raids carried out with all the ruthless ferocity of savage warfare, almost completely depopulated large tracts of country, and, as may be easily understood, at once put an end to the gold-mining industry, which, there is no doubt, was still being carried on in the early part of this century, and also put a stop to the wall-building, as the Mashonas found out that the walls with which they had been accustomed to encircle their towns, and which were probably very often an effective



NATIVE VILLAGE, MASHONALAND.

means of defence against other tribes of their own race, were of but little avail against the braver and better-organised Zulus. Thus the high plateau of Mashonaland, which at no very distant date must have supported a large native population, once more became an almost uninhabited wilderness, as the remnants of the aboriginal tribes who escaped destruction at the hands of the Zulu invaders, retreated into the broken country which encircles the plateau to the south and east. Had it not been for the constant destruction of the native races that has been going on in Mashonaland during the last seventy or eighty years, there would be no room for European immigration to-day. As it is, not only has the occupation of the country by the British South Africa Company been effected without wronging the native races, but it has very likely saved some of them from absolute destruction at the hands of the Matabele.

I have brought the history of Mashonaland up to the time of the recent occupation of the country by Europeans, and I must, before leaving Mashonaland, say a few words about the country itself. Almost the whole of Mashonaland and Manica lies at an elevation of over 3000 feet above the sea, whilst much of the plateau (especially that portion of it lying to the south-east of the main road from Salisbury to Umbali) reaches an altitude of from 5000 to 6000 feet. The higher portions of the country, though lying well within the tropics, possess a thoroughly temperate climate which is primarily due no doubt to their altitude above sea-level, but also in a minor degree, I think, to the fact that it is the highest land in South-Eastern Africa, and therefore catches directly the cool winds coming from the Indian Ocean. At any rate, during the hottest months of the year the heat of the sun is almost always tempered by the breeze which constantly blows from the south-east—a breeze which, during the winter months, is apt to become so keen and cold, that an Englishman suddenly transplanted from home, and deposited, without knowing where he was, on some portion of the Mashona uplands, would never dream that he was in tropical Africa, but would be rather inclined to believe that he stood on some wild moorland in northern Europe; and the sight of a bed of bracken, looking identical with what one sees at home, would only lend colour to this belief. The nights are cool the whole year round, and during the winter months bitterly cold, whilst the excessive heat of the sun, during the spring and autumn, is always tempered, as I have said above, by the south-east breeze. An ounce of fact is worth any amount of theory and assertion, and a table of temperatures kept daily for two years by Major Forbes, at Salisbury, in Mashonaland, and which is now in the possession of Mr. E. G. Ravenstein, will, I feel sure, satisfy any one who cares to examine it that the climate of this part of Africa is an exceptionally fine one for North Europeans.

If not exposed to privation and hardship, it has already been conclusively proved that European women and children enjoy excellent health all over the plateau of South-Eastern Africa—whether in Matabeleland, Mashonaland, or Manica. In fact these are emphatically countries that will rear a strong and hardy race of men—such men as are the descendants of the English and Scottish colonists of the Cape Colony or the burly Boers of the Transvaal. During eight months of the year the whole country is very healthy, but during the remaining four, from the middle to the end of the rainy season, fever is very prevalent in the lower parts of the country, and will almost certainly be contracted by anyone who is unduly exposed to cold and wet in any part of the country.

The same may probably be said concerning many other portions of the world, in which large communities of Europeans are now living; and it has already been abundantly proved, both in Mashonaland,

Manica, and Matabeleland, at Salisbury, Umtali, and Bulawayo, that, given the most ordinary conditions of comfort, and freedom from excessive exposure, white men, women, and children, enjoy as good health in these countries as in any other part of South Africa. I need now say no more concerning the present condition of Mashonaland, than that it bids fair to become at no distant date one of the richest and most prosperous of British colonies. The future of its vast goldfields is becoming every day more assured, and the railway now in course of construction from the Pungwe River to the borders of Manica will facilitate their speedy development, by affording the means of introducing the heavy machinery necessary for mining operations. Three townships have been laid out, not only on paper, as unfriendly critics would have one believe, but in fact, as many substantial brick buildings have been put up both in Salisbury and Victoria, in both of which townships a good weekly newspaper is now printed. Much of the land too has been taken up by farmers, who have already proved that wheat, oats, barley, and every kind of vegetable, such as potatoes, onions, cauliflowers, cabbages, carrots, etc., can be grown with greater facility than in any other portion of South Africa, as the country is so magnificently watered that irrigation works can be carried out during the dry winter months with comparatively little trouble or expense.

Before concluding my account of exploration in Mashonaland, I must not forget to mention that in 1884 my friend, the late Mr. Walter Montagu Kerr, made a very remarkable journey through Mashonaland to Chibinga, and from thence to Tete, and from there through the Makanga and Angoni countries to the southern shore of Lake Nyasa. Dr. Knight Bruce, Sir John Willoughby, and Mr. Swan, who accompanied Mr. Bent as cartographer, have also done a lot of good and careful work in Mashonaland, so that the materials probably now exist for the compilation of a very accurate map of the whole country. In 1884 I met Mr. W. Montagu Kerr in the Transvaal, and he travelled with me to Matabeleland. We there parted company, and whilst he journeyed eastwards through Mashonaland to the Zambesi, I started for the Mababi River, and piloted my waggon for 300 miles across country, chopping my own road as I went, until at last I struck the old hunting track from Khama's town to the Mababi, near the pool of Sode Garra.

I have now given some account of all my journeyings, with the exception of those undertaken in the year 1888 to the Mashuku-lumbwe and Barotsi countries, a narrative of which I sent to the late Mr. Bates in the form of a letter, which was published by him with an accompanying map in the *Proceedings* of the Royal Geographical Society for April 1889. I need not repeat here the narrative which has already been printed in the Society's publication.

In October 1888 I once more reached my waggon at Penda-ma-tenka,
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and, after doing a little more mapping work south of the Zambesi, returned to the Colony, and thence to England, which I reached in the end of February 1889. Early in May I was again in South Africa, and soon afterwards made my way to Mashonaland through the Portuguese possessions on the Zambesi. In the following year, 1890, I guided the British South Africa Company's expedition to Mashonaland, and it is a matter of history that over 400 miles of road were made through a wild country of forests, swamps and mountains without ever a mistake or the detention of the large column of eighty waggons for one single hour owing to the road not being ready for them. This memorable march was accomplished in less than two months and a half, from Fort Tuli to Fort Salisbury. After the occupation of Mashonaland I remained in the country for two years, in the service of the British South Africa Company, and the nature of my work enabled me to make a very careful compass survey of a large portion of the Mashona plateau. Of this work I have already spoken in this paper, and so need say no more here.

In conclusion I wish to point out that with the exception of the attack made upon my camp by the Mashuku-lumbwe, led by a few rebel Marotse, in 1888, I have never had any other serious trouble with the natives. During my twenty years' wanderings I have been amongst many tribes who had never previously seen a white man, and I was always absolutely in their power, as I seldom had more than from five to ten natives with me, none of whom were ever armed. On the whole, therefore, I think I may say that the natives of the interior of Africa with whom I have come in contact have treated me well; and, on the other hand, I can proudly affirm that in my person the name of Englishman has suffered no harm in native estimation.

After the reading of the paper the following discussion ensued:—

Mr. E. A. MAUND: If I may trespass upon your time for a few moments, I should like to say a few words with regard to Mr. Selous. In my hunting excursions up in Matabele and Mashonalands I had the advantage of having hunters, trackers, and boys who had travelled with him; one of them, Van Rooyen, a Dutchman, being one of the greatest hunters in those parts after our Nimrod. The stories of Selous' doings I have often listened to far into the night as described round my camp fire by his excited and admiring followers. Mr. Selous is not only known as a hunter, held in awe by the Matabele for his unerring aim, and beloved by the Mashonas as a food-giver, but he is a map-maker, and the road-maker of Mashonaland, and the absolute pioneer of that part of Africa; for it was he who guided the expedition that opened up that part of the country for our colonisation, which to-day is being developed with such rapid strides. There being so many present who now know that country, I should like, if possible, to make a geographical point to-night, because we do not often get the opportunity of having present at our meetings men who have been five-and-twenty years in such a country, like Mr. Phillips—who I believe is present—and Mr. Selous, who has spent twenty years there, and whose authority should therefore carry great weight. Mr. Bent has said, and I believe has made a point of it in his interesting book, that this

country ought to be called *Makalangaland*. Unfortunately he is not himself present to-night, being at the moment in Africa. Now the people referred to are not *Makalanga*, but *Makalaka*. In the Matabele highlands these people exist in considerable numbers, and regiments are incorporated from among them. Down where Mr. Bent was, at Zimbabwe and on the Sabi (and he was only there for a few months), he says they were called the Makalanga; but the boy who called them so was a Matabele, and among the Amandabele they are called Makalanga as a term of opprobrium; traders, missionaries, hunters, and even themselves in Matabeleland, know them as Makalaka, and there is too a Makalaka quarter in Khama's town. They form but a portion of the native population of Mashonaland, and yet we are told by Mr. Bent that our new colony should not be called Mashonaland but Makalangaland. Mr. Phillips will, I believe, corroborate my views with regard to this difference and its meaning. The *n* sound is often introduced in the Zulu pronunciation of such words, and anyone not long resident in the country might easily fall into error. But in errors of this kind, from whatever cause they may arise, there is what I may call a geographical danger. When Matabeleland is occupied we may be asked to change its name in order to agree with some local Mashona pronunciation; but we may believe, and rest indeed in the assurance that there is a fair prospect notwithstanding, that "*Mashonaland*," the title of our new colony, will survive even the ruins of Zimbabwe.

Mr. GEORGE CAWSTON: I am proud to have this opportunity of testifying in public, on behalf of the British South Africa Company, of which I have the honour to be a Director, to the great services rendered to that Company by Mr. Selous. Mr. Selous has interested us for an hour, as he might have done for many an hour, recounting his experiences and adventures in the country lying to the north of Tuli; but he said but little of the work which will be handed down with his name to posterity. As you all know, I speak of the Selous Road; but as there are probably many here who do not know what was the object of that road, I hope I may be allowed to trespass for a few minutes upon your time in order to explain its objects and its results. When the Charter was granted by Her Majesty, in the end of 1889, to the British South Africa Company, the first object the Directors had in view was to place a settled European population in the centre of the districts entrusted to their care. This was no easy task, and I do not think we here recognise the difficulties of that task and the distances that had to be traversed. I may compare them best with a supposed expedition organised at Gibraltar, to plant a colony somewhere in the neighbourhood of Strasburg. As far as the Pyrenees the road, although difficult, was known and safe; but from the Pyrenees a new road had to be made, through a district known only to one man, and that man Selous, having a strong and very hostile population lying along the flank, somewhere in the neighbourhood of Paris. That road was commenced in the spring of 1890, and in six months it had accomplished its work. You will see from the photographs which Mr. Maund has shown you this evening what Salisbury was, and you can read from its own press what it now is: the centre of a large European population, where thousands can live on the high healthy plateau. But there is one greater result, of which we all feel proud—the having made that road, and effected the occupation of Mashonaland, probably the first time in the history of the world that a civilised people have occupied a savage country without the destruction of the native aboriginal inhabitants. The old order of things has been reversed; for generally the traders went, first quarrelled among themselves, and then quarrelled with the natives, with the result that the natives were destroyed. In this case we, in the first place, not only planted an European population, but a population strong enough to maintain order. The result has been that for the first time

for forty years the Mashonas have not been raided by the Matabele, and the whole of the country has been occupied without the loss of a single life in anger. Mr. Selous has related some of his experiences in the Barotze Valley. I can only say that when the time comes for us to occupy that country these things will be impossible, and the cruelties practised there will be stayed by a strong hand. I believe the fact of our having occupied this country without bloodshed during the first advance is of itself the strongest argument in favour of the policy of colonisation by means of Chartered Companies.

The PRESIDENT: You will not wish me to adjourn the meeting before I have said something about the address which Mr. Selous has delivered. He has mentioned to me that this is the first time on which he has ever addressed an audience. I think that if we had not heard that, we should have supposed that he had done nothing else all his life. Mr. Maund added to the interest of the evening by explaining very clearly his admirable photographs, and Mr. Cawston has brought home to us the work which Mr. Selous has done by a very apt and useful comparison with places which we know in Europe. I am sure you will wish me to return to all of them your most sincere thanks.

MAP OF A PART OF SOUTH AFRICA SHOWING THE ROUTES OF MR. SELOUS.—The map which accompanies this paper is merely intended to show the more important routes traversed by Mr. Selous in the course of twenty years' wanderings. An attempt has been made at the same time to tint the country represented according to elevation above the sea. Unfortunately the altitudes available for that purpose are not as trustworthy as could be desired, and those made by different observers in the same locality exhibit sometimes the most extraordinary discordant results. Lake Ngami presents an instance of the kind. Its elevation above the sea-level is given as follows by succeeding observers:—Anderson 3710 feet, Dr. Livingstone 2900 feet, Chapman 2260 feet, Dr. Holden 2660 feet, and Captain von François 3080 feet. The last of these has been accepted, its calculation being based upon synchronous observations made at Walfish Bay. A map on a large scale embodying the whole of the results of Mr. Selous' explorations and surveys is being prepared for separate publication.

NOTES ON A PORTION OF THE KALAHARI.*

By EDWARD WILKINSON.

It is with great diffidence that I venture to lay before you a few details of recent visits to that small portion of the Kalahari which lies in the north-western corner of British Bechuanaland, and in the adjoining tracts of the Bechuanaland Protectorate. There is nothing of adventure to describe. The notes may, however, be of some use, as they refer to a locality little known, and moreover my trips have led me to

* Read at the evening meeting of the Royal Geographical Society, Monday December 5th, 1892. Map, p. 384.

think that existing maps are in error in their delineation of the course of the Molopo River. What led me there in the first instance is easily explained. I wished for once to exchange an English winter for a foreign summer; and, having decided on South Africa for that purpose, I was further drawn to this special locality by the fact that I had not much time at my disposal, and there was no part which was so little known, which was also so readily accessible. My original idea was to go west from Mafeking, as far as the longitude of Luhututu, thence to Luhututu, and so diagonally back to Mafeking, through Kanye or not, as convenience or necessity indicated. We—that is, my friend L., who accompanied me from England, and myself—fitted out in the usual manner at Kimberley, namely, with a full-tilt waggon drawn by twelve oxen (which soon had to be increased to sixteen), four horses, and the usual complement of black, or half-breed, troublesome servants, or “boys.” Arrived at Vryburg, we met a man very well known in Bechuanaland, and who, if half that is told of him is true, must be the Claude Duval or Starlight of South Africa, and whom I henceforth designate as S.; and he, hearing of our proposed route, expressed a wish to accompany us. This was, mainly, from an idea that we should pass near Chwani, a place south-east of Luhututu, where some maps indicate (but, as I imagine, without sufficient authority) the presence of gold. It was mainly owing to his great knowledge of the country, and topographical instinct where knowledge failed, and to his careful management whereby the oxen survived, and even without much loss of condition, heavy work in a period of extreme heat and drought, that we escaped disaster. We were at Vryburg in 1888, on Christmas Day, or just at mid-summer; and the summer is usually in Bechuanaland the rainy season. This summer, however, the rains failed in the greater part of the country, or did not fall till months later than usual, and this made travelling in all the early months of 1889 very difficult, and somewhat risky. I may say here, that L. and I went over very much the same ground again in 1890-1, having returned to South Africa, partly to make sure of the genuineness of a concession by a native chief of a large area of ground in the region lately visited by us (which concession did not reach England till 1890), and partly, if satisfied on that point, to examine the ground more carefully. Any general views are the outcome, therefore, of the two visits.

The idea of Chwani having superseded that of a more or less vague half-hunting, half-exploring round, a change was made in our proposed itinerary, and accordingly, on leaving Vryburg we went, not towards Mafeking, but in a north-westerly direction through Genesa and Morokweng. These are very large native *stadts*, or towns, the first about 42, and the second about 95 miles from Vryburg. Morokweng, which probably has not less than 3000 inhabitants, is the last large native town before entering the Kalahari. In 1888 an outpost of four

men of the British Bechuanaland police, under a corporal, was maintained there, an insufficient force, as the natives there are much inclined to be troublesome; but on coming back, a few weeks later, we found that it had been withdrawn, it having been necessary to strengthen the force upon the Transvaal and Bamangwato frontiers, and the post has never been re-occupied. Three men are still kept at Genesa, and these are the only representatives of English authority for hundreds of miles, in a region not lying away in the Protectorate, but forming an integral part of the Crown colony of British Bechuanaland. This colony is larger than England and Wales together, and its actual available police force probably does not exceed 100 men, or less than are employed in London between the General Post Office and the Marble Arch. And though exception was taken, in the House of Commons, to a vote for a slight increase in the force on the ground that it was inordinately large already, I am bound to say that I think it quite inadequate, having regard to the increasing insolence of the natives. I only refer to this point as it is one of which intending settlers ought not altogether to lose sight, though I readily admit that the Bechuanas, as a people, have generally been peaceable, and fairly inoffensive.

At Morokweng granite is visible in the bed and round the borders of its fine vley; but it soon disappears, overlaid apparently by a shallow siliceous-calcareous formation. The pans are almost always of limestone, and where pits exist in this part, they are dug out of the limestone. From Morokweng we proceeded northwards, and at Sekeleke, or Skellet, struck the bush country, or desert proper. From here onwards we were always among trees—mainly haakdoorn (equivalent to hookthorn), camelthorn, and mimosa—and we frequently had to cut out a passage for the waggon. I find a note in my diary as follows, in reference to this part of the journey: "The sand is heavy, and the wheels sink in it far over the felloes; but it is rich ground notwithstanding. The luxuriant grass (which grows in bunches or tussocks much as the buffalo-grass of the prairies), and the numerous and various trees, growing in all the wild tangle of nature, make the desert, so far, the most attractive, and, indeed, if I except Barkly West, the only attractive part I have yet seen in Africa." The first view of the Molopo River valley was enchanting. We reached it about seven in the morning, while the dew was still glistening on every bush and blade of grass. Far as the eye could reach trees lined the gently-sloping sides of the wide valley; and the cluck of river pheasants and the noisier clamour of guinea fowls gave cheery signs of life. We fortunately found some rain-pools in the river-bed, and camped there three or four days. There had evidently been natives about the pools; and we were anxious to get their advice and aid in making our way to Kokong; but all seemed to have fled. However, on the second day, a woman was surprised a few miles from the camp, and

her fears being allayed on finding that we were English, she promised to bring in her people. From that time there was always a crowd of them squatted round our camp, quietly grunting their astonishment at our queer ways. The sextant seemed to puzzle them as much as anything. They were all Vaalpense, or serfs. They had fled in the idea that we were Boers come on a kidnapping expedition, that notion having been spread, as I believe, by their masters, who wished to throw every obstacle in the way of our progress. Even when they knew that we were English they wanted to know who our Boer masters were, and for what purpose they had sent us to travel; for the native mind is as yet far from disabused of the idea that, since the Transvaal fiasco, the English have been slaves to the Boers.

I am not competent, and anyhow it would take too long, to describe the various grades among the Vaalpense, and the various ramifications of the Vaalpens system. Speaking generally, the Kalahari is occupied by them. Here they are the vassal hunters of the various tribes—Batlaro, Barolong, Bangwaketse, and others—who live round the desert, being found in guns and ammunition by their masters, to whom they have to account for the skins of all animals killed by them. Hunting, and digging up the roots on which they mainly subsist, are almost the only forms of industry, as the carosses, made from the skins, are more often made up by the masters, who do not seem to me to give themselves, as a rule, much more occupation in life than smoking and lazily rubbing the skins to make them pliable, and fit for sewing together into carosses. The stadts of these master-tribes are full also of domestic Vaalpense, who do the bulk of the work connected with the cornfields; and at any time a master wanting hands can fetch some from the desert. Though more than one flagrant case came under my notice, I should be sorry to say that, as a rule, any great cruelty is practised on them; cruelty is not a characteristic of the Bechuanas. But their lives are undoubtedly hard, if only in this—that those living in the desert are liable to be robbed of everything they may have got together in their desert homes, and also to be called away; and those living in the stadts are in any time of scarcity turned adrift into the desert to shift for themselves. Extreme jealousy is shown of a Vaalpens acting in a way which looks like his being lost. One with the assent of his immediate master accompanied us from Morokweng; but his joy in being with us was marred by the constant threats uttered towards him by members of any master-tribe who saw him; and after two or three months he fled, and returned to his bondage.

The people round our camp insisted that it was quite impossible for us to get the waggon through to Kokong, on account of the density of the timber and the want of water; but they offered to guide us there if we could go with pack-oxen, the time necessary to reach it being, they said, five days. As there was only one pack-ox in our team, we could not

manage this, and we decided, therefore, to follow the river-bed downwards, as it would lead us west. We had the more confidence in doing this, as Mr. Anderson's and other books had led us to believe that water could always be found in the river-bed by digging. Though we only tried hard once to dig for water, I think this, as a general statement, is incorrect. Our effort was made at about 15 miles from our first river camp, and the spot looked promising. It was at a slight bend at the junction of a small *laagtē* with the river-bed, and the late presence of a fair-sized pool was indicated by a coating of dried mud, and, by the presence of a plant which I could not distinguish from our common water *persicaria*. After about 2 feet of hard blue-black soil came about the same depth of hard sand, requiring to be broken by a pick. This gradually became softer, and at about 6 feet was mingled with small shingle, and was white, slightly damp, and cold, but no water oozed through. A very thin band of a sort of pot-clay followed; but soon the dry sand recurred, and was succeeded by a very hard calcareous sand-rock. I knew it was hopeless; but we worked on slowly and painfully till we had got down some 12 to 14 feet, by which time our picks and crowbars were almost useless; and we then gave up in despair. The oxen and horses had been meanwhile sent back for water to our old camp. It is perfectly certain, therefore, that the Molopo is not a sand river, like the Setlagoli River for example, in which the removal of a foot or two of loose white sand reveals the presence of cool fresh water. If the white shingly stratum I mentioned is continuous, it is probable that in an ordinarily wet season, and for some weeks after the cessation of the rains, water would be obtained at its level, but it would probably not be a copious or permanent supply. That is probably to be found lower down, and somewhere near, perhaps, rather than in, the present river-bed.

From what, in memory of our digging, we called Well Camp (not that it was at all well with us there), our progress was very slow. We never dared to take the waggon on till we had explored ahead and found water, this generally meaning at least two days' delay at each camp. We drank up the water as we went, but were fortunate in finding always just enough ahead to go on with. This shows that a little rain did fall, though it very seldom touched us. A fall of the barometer and gathering of heavy clouds occurred almost every afternoon. Each day we hoped to come to the fork in the river given in every map. Unfortunately, in our first visit my half-chronometer, a most reliable instrument generally, went all wrong, gaining far beyond its normal gaining rate, and as we were travelling west, making me think ourselves far more to the west than we really were. I had not taken enough care of it. It was exposed to terrific heat, the thermometer in the sun being frequently over 122°, and to the inconceivable jolting of waggon travelling when I shifted from horseback to the waggon. On our second

journey (which, moreover, was in a much cooler season), I almost lived for it, getting off the waggon over rough ground, and never dispensing with a waistcoat during the heat of the day, so that the watch worn inside it might have the more uniform temperature of my body. On this occasion, therefore, it went well, and this time we had a trocheometer also. Though, however, I do not think that any of my longitudes are likely now to be more than 5 miles in error, you will all know that observations depending on a single instrument, the rate of which constant movement made it impossible to ascertain, are not very reliable. It is curious that though I had taken a telescope the second time, in order to be able to pick up the Greenwich time pretty nearly by observing occultations or eclipses of Jupiter's satellites, I had not a single chance afforded me, clouds in this unusually wet season always obscuring the heavenly bodies at the critical moments. To reach this fork of the river was of great importance to us. If the maps were right, Kuis, with its water-pits, lay within 50 or 60 miles of it, a possible distance to travel without water, if sure of it at the end,—and Maubelle was supposed to come before Kuis. I cannot satisfy myself that any such fork exists. A short distance before Mokopon the river-bed turns nearly south, and though a laagtē comes in from the west near the corner which would, in position, in some respects answer the northerly branch of the river, my friends, who explored it, said that it was uphill, not a descent of a river course, and that it soon led them out on the high flat veldt. The natives at Mokopon always expressed ignorance of any other river-bed. I can only suggest two explanations. One is, that as "Molopo," or "Molapo," means water in Sechuana—so that even a wretched little hole in the ground near Maralilen, where water collected at about the rate of half a bucket an hour, was called the "Molopo"—travellers, on finding some river-bed coming from the north or north-east into that of the Molopo below Kuis, and hearing both called Molopo, may have considered it to be the reunion of two branches of the same river. The other is, that the latitudes given in the maps are wrong, and that the fork occurs more to the south than the crossing between Honing Vley and Maubelle.

We continued to follow the river-bed for a few miles; but beyond a place which we called Circus Camp, a short way below Mokopon, we could not find or hear of any more water in it. S. ascertained that there was some at Maralilen, and it was decided that I should go there with the waggon, and thence next day push on to Maubelle, believed to be about 15 miles further, while L. and S. rode on down the river, taking a pack-horse with a bag of water. The bag had been very skilfully made by them out of L.'s waterproof ground-sheet, with an outer covering of navy-boiled canvas, the bag being made with two ends, like the long purses of our young days, so as to balance one another on the animal. We often found it useful afterwards. Starting

on February 3rd at sundown, I was quickly brought to a standstill by a light drizzle, which compelled me to outspan, as wet with the friction and pressure of the yokes quickly makes the necks of the oxen sore. It lasted more or less all night, and day was breaking before I could push on. It was dreadful travelling, the sand very heavy, with a black dust rising from the grass, which had been burnt for miles. At last, at 1 A.M. on the 5th, we reached what Sehetlani—a guide picked up at Circus Camp—told me was Maralilen, but which I found in 1891 to be Kesa, 3 miles short of it. I was most anxious to water the animals at once; but he told me it was impossible, though he did not explain the reason. At earliest dawn I roused the camp, and we proceeded to lead or drive the animals to Maralilen. The water there was in a small fissure in the quartzite rocks about 12 feet down, and I was delighted when Sehetlani sent up two buckets full of water without any delay. Then, however, we had to haul up sand for an hour or so, and by this time the gathering of several natives—mostly women, armed with reeds—brought home the appalling idea that this was after all only a sucking pit. The suckers scoop out a hole as far as they can reach with their arm, and into this thrust two reeds, one with grass bound round the lower end to serve as a strainer, the other to keep up communication with, and thus the pressure by, the outer air; and then, filling in the hole again, they commence sucking, ejecting the water from their mouths into tortoise-shells or other receptacles. There was room for but three in the hole at one time. The rate at which they can work is extraordinary; and how these poor creatures worked, relay after relay, indefatigable beyond all others being Sehetlani and his two wives! But fancy watering a span of oxen and horses in that way! The oxen were wild for water, and could hardly be kept from the pit. Each was given three small buckets full; but the last did not get his till 2 A.M. on the 6th, long before which those watered early on the previous day were moaning for water again. They were, no doubt, in a sort of panic; for even when watered they would not graze, but stood bellowing with those whose turn was still to come. The water and suckers alike exhausted (for a considerable community had had to be supplied as well as my cavalcade), there was nothing for it but to inspan at once and make towards Maubelle. But as soon as the sun rose the oxen became mad and ungovernable; and though we had only done about 4 miles, outspanning was compulsory. Fortunately, there was the little hole here which I have previously referred to in connection with the word *molopo*. The only chance was that I should at sundown leave the waggon and three of the boys, and, taking the other boy, endeavour to drive the animals through to Maubelle. I should certainly have failed. The night was dark, there was no track, and the only notion I had of the direction of Maubelle was the pointing of the natives. About mid-day, to my intense surprise, L. and S. rode up to the camp

from the south, they equally surprised to see me, as they had thought I should be safely at Maubelle by the 5th. They were in bad plight; they had had no water for some time, and L.'s horse was at the last gasp. Finding no sign of track to Maubelle, they had come up out of the river-bed, and S. recognising the Maralilen kopje, they were trying to reach it. Our "molopo" and a barrel of water on the waggon saved them that extra journey. S. at once saw that my plan was the only one, but that he must go, and not myself. So at sundown he was off again with one of the boys and all the animals, except L.'s horse, which still had to be nursed at the waggon; and, thanks to his marvellous instinct and endurance, he succeeded in hitting Tsebūn, near Maubelle, though not till 11 A.M. next day. The distance was about 28 miles. He had to remain at Tsebūn for three days to recruit the animals (we at the waggon being meanwhile supplied with water by Sehetlani's wives, who brought it from Maralilen), and still had to leave three of the oxen behind when he started to come back. On the night of the same day on the morning of which he reached us, we trekked about 8 miles, on the next night about 12 more, and on the third day sent the animals forward once more to Tsebun, whence, returning, they took us safely through to Tsebun the same night. It was a disagreeable experience, and one which, though I do not pretend that we went through anything out of the common for travellers in the Kalahari, might, I thought, be of some interest.

It being quite clear that we could not get to Chwani from this side we went back to Morokweng as quickly as we could, going by Honing Vley, helping our oxen for the first third of the sandy waterless journey to that place by hiring a span of oxen at Maubelle for that distance. From Morokweng we went to Kanye, through Pitsani and Mafeking, for some little distance before Pitsani, closely following the line of the Molopo course when not actually in its bed. At Kanye we met a German trader who had already made two journeys to Luhututu direct from Kanye, and was about to attempt it again. We joined forces, but the drought drove us back when we got as far as Mesēken. The country west of Kanye, after one clears the rugged and picturesque hills near that stadt, is never destitute of trees, in clumps or belts, but it is fairly open; and the cattle at the posts looked splendidly. The sand was not quite so heavy as in the Mokopon-Maubelle-Honing Vley round. Secūma was supposed to be a good watering-place; but L. rode forward to investigate, and found it dry, while the German and the natives said that Kama, the next watering-place beyond Secūma, would not serve our purpose, as the water, when low in the pits—as it certainly was at this time—was unwholesome, often to the point of being fatal both to man and beast. Our German friend supplied me with the names of all his halting-places to Luhututu. I have not attempted to put more than two or three in the map, and the positions of these are quite uncertain.

The Bangwaketse extend as far as Kokong, and next to them, on the south and west, come the Western Barolongs, whose ground extends very nearly to Luhututu, and also comprises the places marked to the west of the river, excepting Maubelle and Tsebūn, which, though the waters there were first opened by Barolongs, appear now to recognise the Batlaro supremacy. Kang is universally recognised as Barolong; but I rather think Kangñoa must be meant rather than the Kang on the Luhututu and Molepolole route; as this Kang, if not under Sechele of Molepolole, must, I think, be under Maparo of Luhututu. The road between the two last-mentioned places is from a survey by Major Gould-Adams. I never travelled on it myself. It puts Luhututu more to the south than previous maps do, as my own map does also with regard to Kuis. It will, of course be understood that though the different tribes have very accurate ideas as to their respective territories—as to which the traveller judges best by finding out to whom the Vaalpense belong—no such thing as a physical boundary exists.

On our second journey in 1890 we began by going from Vryburg to Maubelle by Honing Vley. I had received concessions of land from Toto, chief of the Batlaros, and from Letlogile, chief of the Western Barolongs. Both told me that what they had given me was valueless, as, though the veldt (grass) was splendid, it would pass the wit even of the white man to find water. I had accidentally met at Vryburg Mr. W. H. Penning, F.G.S. well known in connection with the Geological Survey of England, and he agreed to accompany us to see if anything could be learnt about the geological formations. On this journey the rains were abundant, and there was water at all the places mentioned on the map, generally in open pools, but sometimes in pits. Everyone told us that we should never be able to cross the river, that it was running breast-high, and so on; but that in no way deterred us. For one thing, I did not believe it for an instant; for another, I thought how delightful beyond everything it would be to hear the brawling of water in that silent, sandy valley. Had this happened, we should, after seeing all we wanted near the crossing, have most certainly followed the torrent, and so settled once for all the course of this baffling Molopo to its junction with the Orange River. Alas! it was, as I expected, as dry as though water had not fallen or passed there throughout the ages. At Maubelle, however, where in 1889 the water was deep down in pits, it in 1891 overflowed the pits, the mouths of which were lost in a shallow surrounding pool. This lost me a good horse, for, going into the pool to drink, knee-haltered in the usual fashion, he fell into one of the pits and, his head being held down, he was drowned in a wretched hole not 20 feet in diameter. On reaching Mokopon again, we determined to strike out a new route direct to Sekeleke, and were fortunate in finding some delicious water midway at Kgetloa. This is only the name of a basin; there did not seem to be any stadt. As from Maubelle to Mokopon, so

from this latter place to Sekeleke, the country is densely covered with low trees, and from the hills at Maubelle, Tsebūn, and Ōkwān, the eye travels over an unbounded expanse of timber. Till roads are cleared, however, it is a great mistake to travel here with a large waggon requiring a long team of oxen. Sharp turns among the trees are incessant, and all the work of these falls on the four or six after-oxen, which are sorely tried, not aided, by the oxen in front pulling often almost at right angles to the waggon's line of advance. A broad-wheeled Scotch cart or light spring waggon drawn by six oxen is the proper conveyance, and for mere exploration, pack-oxen would be still better. Our oxen's necks were in such a bad state from the heavy pulling and twisting about on our arrival at Sekeleke, that it seemed better for me to return by easy stages to Vryburg; but Mr. P. and L. went off with Mr. P.'s light waggon to Honing Vley, anxious to get thence to Kuis, so as to ascertain its true position. This the ill-will of the natives at Honing Vley and Madebing prevented. They got as far as Madebing; but orders going forth that no guides or information as to water should be given, and no communications even held with them, they had to turn back. The loss of the horse was much felt here. If they had been able to make an attempt on horseback, as would have been possible with two spare horses, or even one, they would probably have reached it. The position of Kuis on the map is therefore only a guess, arrived at from the intersection of lines of direction indicated by natives at Tsebūn, Maubelle, Honing Vley, and Madebing; these last very likely given wrongly intentionally. There is no doubt, among a section of the natives, considerable jealousy of white men penetrating into the desert; but I fancy the dislike to Kuis becoming better known arises in great measure from its being a depôt of stolen horses, which are thence sent, as opportunity serves, to Namaqualand and Damaraland, to be exchanged for cattle. Whether Kuis is here placed anything like rightly or not, it must be somewhere to the south-west from Maubelle, and I do not think the position of Maubelle is far out. I think it certain that I am referring to the same place as that marked Kuis on all the maps, for there is no doubt as to its being a large Batlaro cattle-post with good pits, and a well-known halting-place on the desert road to Luhututu. There must, however, be several places of almost similar names, for one finds dotted about in maps and within a small area, Kuis, Kheis, Keis, and Kesa—this last a contribution of my own; and the natives also spoke to me of Kuisē, apparently referring to Kuis. The bulk of the natives, and most certainly the Vaalpanse, whose homes are in the desert, would, I believe, welcome English settlers as meaning free work and wages, being well aware that the desert, thanks to the introduction of firearms, does not produce enough valuable game now to be of much account. There is not, indeed, much game now of any sort. We saw hartebeests, gemsboks,

springboks, wildebeests, ostriches, and of course steinboks and duikers; but only the last two at all plentifully. West of the river, or, rather, as soon as the bush-country is entered, winged game is also scarce. I expect this is owing to the want of water, as, until we left the water behind us, partridges (more strictly, francolins), sand grouse or Namaqua partridges, pauws, koorhans of two sorts (the pauw and koorhan are both bustards), and guinea-fowls, were common enough. The temporary supply of water found on our second visit of course would not bring them into the heart of the bush-land; and besides, I fancy many of the gallinaceous birds are generally much more plentiful near habitations and cultivation.

I have used the word "desert" frequently, but as that name has already had to recede from British Bechuanaland and Griqualand, so I think it will shortly have to recede still further. It is true that most of the country west of, say, the longitude of Mafeking has a sandy soil, getting generally heavier as one goes west, and practically no visible water; but the sand, so far from being sterile, is covered with grasses, many of them well suited for stock; and where it is red, it produces, in years of good rain, or where irrigation can be carried on by means of reservoirs, magnificent crops of mealies and Kaffir corn. I have seen acres—I might almost say miles—of fields where I could not reach to the top of the plants. It must be admitted that the bulk of this more favoured ground is in the native reserves; yet there are very many good farms to be had still, on which laagtēs or other depressions readily lend themselves to the construction of reservoirs, or on which water can be obtained from pits of no great depth. The objections that I see to settlers taking up such farms lie not so much in their not being likely to pay if well looked after, as in the want of English wives and white labour. As it is, the farmers' homes are not homes, and white men very rightly will not be fellow-labourers with the natives. The rainfall seems to get less as one travels west; but in the part of the Kalahari which I have more particularly attempted to describe, it is enough to cause the country, timber and bush-covered as it is, to look more like a park than a desert. The sand, however, sucks it all in, and unless it can be rediscovered by boring, I think the view of the chiefs as to the valuelessness of the country is correct. If, however, strong supplies could be tapped at distances of, say, 12 to 15 miles, or at such distances as stock can circulate between without loss of condition, I see no reason why the district should not carry very large herds of cattle and goats, and, after a time, of sheep also. The grasses would improve by being fed off, and improved grasses could be introduced. Haymaking, at present practically unknown in South Africa—anyhow, north of the Vaal River—might go a long way to prevent the loss of condition from which all stock suffers in this country during the winter. It is not that there is no grass then, but it is brown and dry, and,

unlike the buffalo grass of the prairies, has then parted with most of its nutriment. In my opinion the district can never be an agricultural one, never even one in which it would pay to mark out separate farms, each of which would want to have water found for it. The only chance of utilising it (but that, I think, worth trying), is that a vast tract should be in the hands of a powerful company which could go to the expense of boring, and, if successful, of sending in stock and stockmen. The climate is marvellously healthy all the year round. On the water question I think I cannot do better than quote extracts from Mr. Penning's report:—

"There certainly is a scarcity of surface water in this region, as there is also in British Bechuanaland and in some parts of the Transvaal; but the Kalahari is not a 'desert' in the ordinary acceptation of the term, any more than are Bechuanaland or the 'high veldt' of the Transvaal. Comparing the Kalahari with those areas, we find similar surface springs in many places, the old stream and river courses now equally dry, and the land possessing the same natural fertility, while exhibiting a much larger proportion of bush and timber. After close observation I am convinced that in many localities the scarcity of surface water may be greatly reduced by shallow wells and by conservation; and in other parts (but not in all) a deep-seated supply of water may be relied on. *A priori*, it seems impossible that an abundance of timber and bush could subsist, or have come into existence, without a supply of moisture far in excess of that due to occasional periods of even heavy rain. Then there is the geological testimony; and the observations herein classified are reliable, although frequently taken at intervals widely separated owing to the uninterrupted stretches of sand which nearly cover this region. This sand presents the only real difficulty in the solution of the problem of water supply in the Kalahari. It masks nearly all the older surface features. It rests equally on siliceous, calcareous, and argillaceous formations (on the alternation of which depends the flow of underground water), and it forms a flat or gently undulating plain, though it must vary from a few inches to several hundred feet in thickness. It is doubtless a blown sand, as it presents no essential local differences except slight variation in colour, in this respect differing from sands locally formed, which in texture, coarseness, and colour, indicate the rocks from which disintegration has derived them. It generally happens that the evidence of water-bearing strata beneath a given point must be sought at a distance. It is so here, the rocks which outcrop in north-west Bechuanaland passing in by a westerly dip under the sand of the Kalahari. These rocks, fortunately, belong to series previously studied in the Transvaal and Bechuanaland, their continuity with which was readily established by a series of highly ferruginous magnetic shales, forming an almost (or quite)

unbroken geological horizon for several hundred miles. The formations in ascending order are :—

1. "Granite, the bed-rock of the whole country, a solid non-water-bearing mass, but having an undulated surface, in the channels of which water may and does accumulate, flowing out as small surface-springs. It comes to the surface about the head of the Molopo River, at Mosita, at Morokweng, and along the Mashowing River, near Madebing, sloping away westward under the Kalahari. It forms a solid substratum, holding up any water that may have escaped from the more permeable strata above.

2. "A series of hard crystalline siliceo-calcareous beds, occurring in great force near Kuruman, but thinning away northwards. It is only slightly water-bearing, except along lines of fissure, which frequently give rise to permanent springs.

3. "A series of highly-altered shales, very ferruginous and highly magnetic. They are so hard, and comparatively impervious to weather, that their outcrop forms a distinct escarpment, or 'krantz,' which can be readily followed for hundreds of miles; but, though hard, they are in thin beds, and much broken up, being thus fitted for the transmission of water, and the series is, in fact, the best water-bearing formation of the region. These beds may be seen all along their outcrop, which follows, and, indeed, forms, the range of hills from near Madebing, through Honing Vley, to near Sekeleke, and may be considered the proper physical boundary of the desert; for the deep sand begins immediately behind them. The escarpment exhibits numerous small springs that weep out from the bedding-planes, and it may be confidently assumed that this formation will yield water wherever tapped by wells or borings towards the west of its outcrop—that is, towards and in the Kalahari.

4. "This series uncertain, its outcrop being everywhere hidden by deep sand. It probably consists of alternating pervious and impervious beds, which (to judge from the Transvaal equivalents) are sandstones, shales, quartzites, and interbedded traprocks.

5. "A large series of hard, impervious quartzites, forming the ranges at Maubelle, Tsebun, and Mararalen, and seen, also with westerly dip, at the great southerly bend of the Molopo, near Mokopon. These quartzites hold down the water that is held up by the granite, and if penetrated by deep borings, should give rise to true artesian wells.

"It has not been possible yet to decide on the thicknesses of the formations—in other words, the depth to which borings must be carried—or to take accurate levels for determining the height to which water would ascend in such borings. There are however other sources of supply, possibly, for the moment, of even more importance. It will have been gathered that the desert sand masks all the older surface-

features of the country, the chief of these perhaps being the old channel of the Molopo. At one time this must have been a large river, carrying all the waters of the region and the waste of its rocks to the Orange River. Now no water flows visibly along its course save for a few miles below Mafeking; but it passes under the sand, as in many other cases, as, for instance, in the Mashowing River, where, with no visible water, a small hole in the sand, only a foot or so in depth, discloses excellent water—not stagnant, but gently passing along. This must happen also in the Molopo, but on a much larger scale, having regard to its enormous collecting area, the rainfall on which must go somewhere; and there seems no other possible mode of its passing seawards than through the lower part of the blown sand now filling its *old* channel. The more recent course of the river follows somewhat, but by no means exactly, the original channel, which is indicated here and there by earthy limestone deposits, found first on one side, then on the other, of the modern channel (now dry) of the Molopo River. There are thus two distinct sources of supply here: first, the underground waters passing through the sand beneath the thicker parts of the limestone, which should yield a good and constant flow at a depth much less than that of the deep-seated springs; second, the present bed of the river, which is saturated at a small depth, probably throughout, but certainly in numerous places, as shown by the many small pans, sometimes full of water, in other cases covered with water-grasses and rushes.

"It will doubtless be urged that hidden waters do not exist in a (so-called) desert region almost destitute of surface springs, and in which, for a good part of the year, the natives rely upon sucking-pits and wild water-melons for small supplies of water; but the actual existence of even a few springs, and possibly even the growth of the melon, and certainly the growth of trees, indicate that there is water below the surface. Further, natural laws must work in the same manner all the world over, however their results may be modified by local conditions; and the rainfall of any district must either flow away by visible rivers or by underground channels, or be received into permeable strata below. The annual rainfall has not been ascertained."

As to this last statement, I have recently been told that the rainfall is at Vryburg about 28 inches a year. In the summer of 1890-91, a season of unusually abundant rain, it was 50 inches. One word more on a point as to which enquiries are always made in connection with Bechuanaland—viz., its mineral wealth. Personally, I saw no indications of minerals, but yet the chances seem much in favour of their existence. Gold has been found in considerable quantities at Malmani, in the Transvaal, close to the British Bechuanaland frontier, though I believe the results of working it have been disappointing. It has also been found at Kuruman and

Mosita, but in nothing like payable quantity. Boring for water—and without water no mining operations on a large scale could ever be carried on—may quite well lead to the discovery beneath the monotonous sand of strata and minerals of which no surface indications can ever be given.

After the reading of the paper the following discussion ensued :—

MR. H. A. BRYDEN : I am afraid I am not prepared to make many remarks, but I can bear testimony to the able paper we have listened to in this respect, that there is a great future for the Kalahari in the way of cattle farming. To effect this, however, British money and British enterprise must find their way into the country, and well-sinking be carried out on a large scale. Beyond this, not much can be done with it, although, as a cattle country, it is so fine. There is good grass and plenty of timber, but there is little or no surface-water, and extensive well-sinking operations must be undertaken before the country can be developed. I have seen much of the country, both north and south, during the last two years, and consider it admirably adapted for ranching.

MR. R. ST. STEPHENS : I have had the pleasure of travelling in this country, and can bear Mr. Wilkinson out fully as regards the splendid pastoral prospects in the districts between Mafeking and Vryburg, and in the direction of Morokweng, where magnificent plains, covered with fine grasses, are to be found. I was hoping to hear some report by Mr. Penning, who is a distinguished geologist, as to the mineral products of the country. Mr. Wilkinson said he had been unable to see any signs of precious metals. I can only say that, after wandering over the country for a year or two between Vryburg, Morokweng, and Mafeking, I never saw any trace of gold or a lode of any description, and I take it that it is geologically impossible, as the whole country is granitic gneiss. I say this more strongly, because I see in the prospectus of a Company, issued last Saturday, it was stated that, in the very place where Mr. Bryden and I had made extensive researches without finding any indications, there were rich lodes giving as much as four ounces to the ton. This is a great shame, as there is no lode in the country, and I take it that Mr. Penning would confirm the statement I have made as regards the lack of auriferous wealth in the country.

MR. WILKINSON : The report by Mr. Penning, which I have in my hand is simply a statement of the sequence of the geological strata, and does not touch on the question of gold; I had, however, many conversations with Mr. Penning about it. He had been to Kuruman and Mosita, where gold is said to have been found, and his opinion was that it was far from being payable, and that it was madness to think of getting up companies or attempting any work on the strength of any indications that he saw there. I do not think he expects much gold to be found in that part of Bechuanaland. Boring to reach water in what is called in this paper the third series of rocks, a series traceable also in the Transvaal, may bring something to light in the at present unknown series which overlies it to the west, but my own impression is that the gold is not on the west or Kalahari side, but on the east side, if not of the frontier, yet at least of the outcrop of that third series.

THE PRESIDENT : I think you will instruct me to close the proceedings by returning your very best thanks to Mr. Wilkinson. I think he is likely to return to Africa, and I hope when he has made further explorations he will again give us the pleasure of his company and the advantage of his information.

MAP OF THE KALAHARI.—This map is based on a map prepared by Mr. Wilkinson. The longitudes of Vryburg and Genesä were supplied by the Surveyor-

General of British Bechuanaland. That of Morokweng was fixed by chronometer, and is the mean of two visits. Since the publication of his map in *Petermann's Mittheilungen*, Mr. Wilkinson has thought it necessary to allow a somewhat different rate for his chronometer, and has recalculated the longitudes, but they must only be regarded as approximations. Latitudes were fixed by observations for meridian altitudes of the sun. The altitude of Maralilen on the map in *Petermann* ($25^{\circ} 39' S.$), is from an observation taken in 1889. In 1891, however, when they reached Kesa from the south, a native who had recognised them, assured them that Kesa was the place where the waggon halted the night previous to the oxen being taken to the sucking pits at Maralilen. Mr. Wilkinson himself did not recognise it, but if it were so, it is clear that Maralilen cannot be north of Kesa, or they would have come to it first. Mr. Wilkinson therefore places Maralilen on the same latitude as Kesa. The geological features and some topographical details along the course of the Molopo are from a map by Mr. W. H. Penning, F.R.S.

THE SANDGATE LANDSLIP.

By W. TOPLEY, F.R.S.

THE sea-front of the coast near Folkestone, Hythe, and Sandgate has long been known for its tendency to slip, and numerous examples of landslips, small and large, are there to be seen. In all these cases the cause of the slip is the geological structure of the ground, the strata consisting of alternations of pervious and of more or less impervious beds. At Eastwear Bay, between Folkestone and Dover, there is a huge tumbled mass of chalk, known as "The Warren," which has slipped over the impervious gault clay. As we proceed from east to west along the shore lower strata occupy the surface. Folkestone is mainly built on the highest division of the lower greensand—sands, sandstone, and hard calcareous bands, known as the Folkestone beds; these underlie the gault, and they overlie a set of clays and sandy clays known as the Sandgate beds. Where the latter beds crop out the old landslips begin, and they continue westward along the shore.* The town of Sandgate is built on an old landslip of the Sandgate beds, and the recent slip is only a small movement in the old slip. West of Sandgate the Hythe beds rise from beneath the Sandgate beds. These are bands of limestone and calcareous sandstone; they rest on Atherfield clay. The Atherfield clay, along its whole length for many miles to the west, has slipped more or less over the weald clay which underlies it, often bringing down masses of the overlying Hythe beds.

Three miles to the west of Hythe are the remains of Studfall Castle,

* Accounts of a landslip between Folkestone and Sandgate, which forced up the rocks along the shore, are given in the *Phil. Trans.* for 1716, p. 469, and for 1786, p. 220.

a Roman fortress built on the slope of the hill on Atherfield clay. This castle was destroyed by a landslip which probably occurred before the Norman Conquest. In *The Gentleman's Magazine* for 1756 (vol. xxvi, p. 160) there is an account of a landslip which occurred near this place in 1725. The slip occurred during a very wet season. A farmhouse silt down about 50 feet during the night, so gently that, it is said, the people inside were not aware of what had happened until in the morning they were unable to open the door. A similar gentle movement of the ground is apparent at Sandgate, where, during the recent slip, a greenhouse was wrecked, but it fell so slowly that most of the glass was unbroken. Slips frequently occur along the Atherfield clay near Hythe. Small movements of this kind occurred at the same time as the recent Sandgate landslip.

Behind the town of Sandgate there is a high cliff of Folkestone beds, below which come the Sandgate beds. At the western part of the town there are the Hythe beds, which also appear as rocks on the shore in front of the town. The dip of the strata is towards the north-east; the normal dip is gentle, but high dips are sometimes seen which may be due to slips. A deep cutting for a sewer is now open on the slope near the centre of the town. The effects of the old landslips are evident here, for below sandy clay of the Sandgate beds there are masses of peaty stuff containing recent plants. This old landslip must have been far more extensive than now appears, for its seaward front had been worn back by the waves before the town was built.

Special local causes may possibly have some influence in determining the exact position and origin of any landslip along this coast; but the main cause is always the same—the saturation of the land by heavy rains. The nearest rain-gauge to Sandgate is that at Hythe, where observations have been taken for many years by Mr. H. B. Mackeson, F.G.S. The average rainfall for February at Hythe, during the ten years 1883–1892, was 1·95 inch, with 13·8 wet days. This year the fall was 4·3 inches, twenty-four out of the twenty-eight days being wet; 1·06 inch fell on one day (February 21st).*

The Sandgate beds, in their undisturbed state, are only moderately retentive of moisture, from the large amount of clay which they contain; but when in a slipped and broken condition, as at Sandgate, they can contain a great deal of water. The recent excessive rains saturated the ground, and rendered the whole mass unstable.

The recent slip took place along an area 2775 feet in length, with a maximum breadth of 700 feet, measured from the back of the Encombe grounds to high-water mark. The foreshore was also moved for a breadth

* In Symon's *Monthly Meteorological Magazine* for March there is an account of "The Sandgate Disaster," giving details of the February rainfall in East Kent, the fall varying in six stations from 3·06 to 4·30, that at Hythe being the largest.

of perhaps 300 feet, making about 1000 feet in all. The extreme eastern limit is at the eastern end of the coastguard station; the western limit is just opposite the centre of the Military Hospital. The greatest vertical movement seems to have been about 10 feet—this is in the Encombe grounds; the horizontal movement of the slip is also small. The maximum effects are to be seen in various places in and near the Encombe grounds; fortunately, there are few buildings here.

The rocks on the shore were slightly moved, a bed of clay being ridged up about 4 feet. This movement of the rocky Hythe beds, and of the clay lying near, was probably due entirely to pressure from the moving mass of Sandgate beds.

As a "landslip" the movement is a comparatively small affair, and would have attracted but little attention were it not for the damage to houses; this, unfortunately, is large. No dwelling-house actually fell, but many are so much injured that they must be taken down.

The prevention of future slips is a simple matter, though necessarily a costly one for so small a place. Deep drains must be carried along the back of the undercliff, to carry off the water percolating from the Folkestone beds above; the undercliff must also be thoroughly drained, and no surface-water, other than that due to the rainfall on the area itself, must be allowed to enter the ground. This is the plan recommended to the local board by Mr. Baldwin Latham.

Much has been said about the probable effects of blowing up two wrecks off the shore—the *Calypso* in June 1891, and the *Benvenue* between September and December 1892. But any effect due to the former should have been felt long ago. The vibrations caused by the *Benvenue* explosions seem to have been no greater on the shore than those made by heavy storms at spring tides; but they of course shook the land behind more than such storms do. It is impossible to say that these explosions had no effect in rendering the land more unstable; but sufficient other causes for the landslip are apparent, and similar though smaller slips occurred along the coast in other places where these explosions could have had no influence whatever.

Another cause which may have partially assisted is the want of shingle on the foreshore. A sea-wall with groynes has been built on the east of Hythe; this largely stopped the eastward movement of shingle, and the sea-front of Sandgate suffered. New groynes have, however, now been built here and the shingle is again accumulating. If the want of shingle were the real cause of the slip its effect ought to have been felt some time back in wet weather. The want of support to the foreshore may possibly have had some effect in determining the exact time of the slip, when the ground became fully saturated, for the first important slip occurred at 7 p.m. on Saturday, March 4th, at low spring tides; the ground moved slightly during the night, and a second slip took place at low tide the next morning.

CHILAS.

By General Sir MICHAEL A. S. BIDDULPH, K.C.B.

As attention has been directed recently to fighting in Chilas, it seems well to put on record what we know of this remote corner. To define accurately where lies Chilas, let us describe concisely the main features of the road from Kashmir to Gilgit. Leaving the valley of Kashmir at Bandipore, a high ridge is crossed, and the road traverses the plain of Gurais. Then following the valley for a few miles—this part highly dangerous from avalanches in the spring—it crosses the Kamri Pir,* over 14,000 feet, and follows the Astor waters to the Indus, at the foot of the Hatu Pir. Hence to Bunji, the ferry over the Indus, the road coasts along the river for about a march, exposed in this part by the vicinity of the Yaghistan border, and the raids of the Shinaki tribesmen. It is not necessary for our purpose to follow the road any further. At the ferry we are eighteen marches, and at Gilgit twenty-two marches from Srinagar. As the crow flies it is only 130 miles, but about 100 miles are added by the windings on the way. Exactly opposite the foot of the Hatu Pir, on the right bank of the Indus, is Taliche, the extreme limit of Yaghistan, which extends all the way up the river from the Black Mountain to this point. At this place a small fort has lately been erected, and a garrison detached from Gilgit holds it to guard the exposed road above described. The tribesmen of Chilas, and those in concert on the right bank, have free access to Taliche,† and recently fired on our troops, and wounded an officer near Bunji. It is believed that the recent attack of the tribesmen was against our detachment at Taliche.

Descending from the Kamri Pir, about a march short of Astor village, a road turns due west up a branch valley, which is blocked by the magnificent mass of Nanga Parbat, 26,620 feet. As the floor of this valley is only about 8500 feet, perhaps here is seen the most remarkable and beautiful view of a great mountain in the world. Tashing, at the foot of the mountain, is the last village on the road, which, following a glacier valley—Rupal Nala—right under the highest peak, turns the Nanga Parbat, and gains the Chilas country by the high and difficult Mazeno Pass. Thus the Chilas country lies on the north slopes of Nanga Parbat, which, with its huge limb stretching to the Indus, forms its east and south boundary. Chilas continues to touch Kashmir territory on head-waters flowing to the Kishn Ganga, and here there is

* The new road goes over the Burzil or Dorikhun Pass. There is a summer track over the Kamri.

† The people of Taliche make common cause with those of Chilas, of whom they are an offshoot.

a pass to Shardi. Then Chilas touches British territory on the passes into Khagan, of which the Babu sar gate is the most practicable. Seven marches lie between Khagan and the village of Chilas. On the western boundary Chilas is open to Yaghistan, and on the north it touches the Indus.

The country of Chilas, where it borders on the Indus, has only an elevation of 3400 feet. It is described as bare and treeless. Previous to our recent occupation no European traveller had ever visited Chilas, and we know little about the topography and climate. It is likely that the vast elevated snows of Nanga Parbat drain all the clouds, and that the country of Chilas is practically rainless. Hemmed in as Chilas is by very elevated mountain ranges, only reached from the outside world by passes open only for a few months in the year, the difficulty of access has given the people a spirit of independence and a distinctive character. They have been determined raiders from all time. Vigne describes the raids of the Chilasis, which, laying under contribution all neighbouring valleys, extended into Kashmir itself. During the Sikh occupation an expedition sent against Chilas met with a disastrous defeat. In 1851 the Maharaja Golab Sing, with permission of the Government, exacted reprisals for a successful raid. Two columns entered Chilas, one by Shardi in the Kishn Ganga, and one from Astor by the Mazeno Pass. The Chilasis were defeated, made submission, and afterwards paid tribute, and sent hostages to Srinagar; since then they have been more or less quiet. In 1865 we found, however, that the villagers of Tashing had still a terror of the Chilasis, and even then there was a piquet kept in the Rupal Nala on the look-out. We noticed several men maimed and wounded in conflict with their warlike neighbours in defence of their families and property.

With such hardy and practised raiders immediately on the flank of our military road to Gilgit, it is necessary to hold the posts with a strong hand; any relaxation would invite certain disaster.

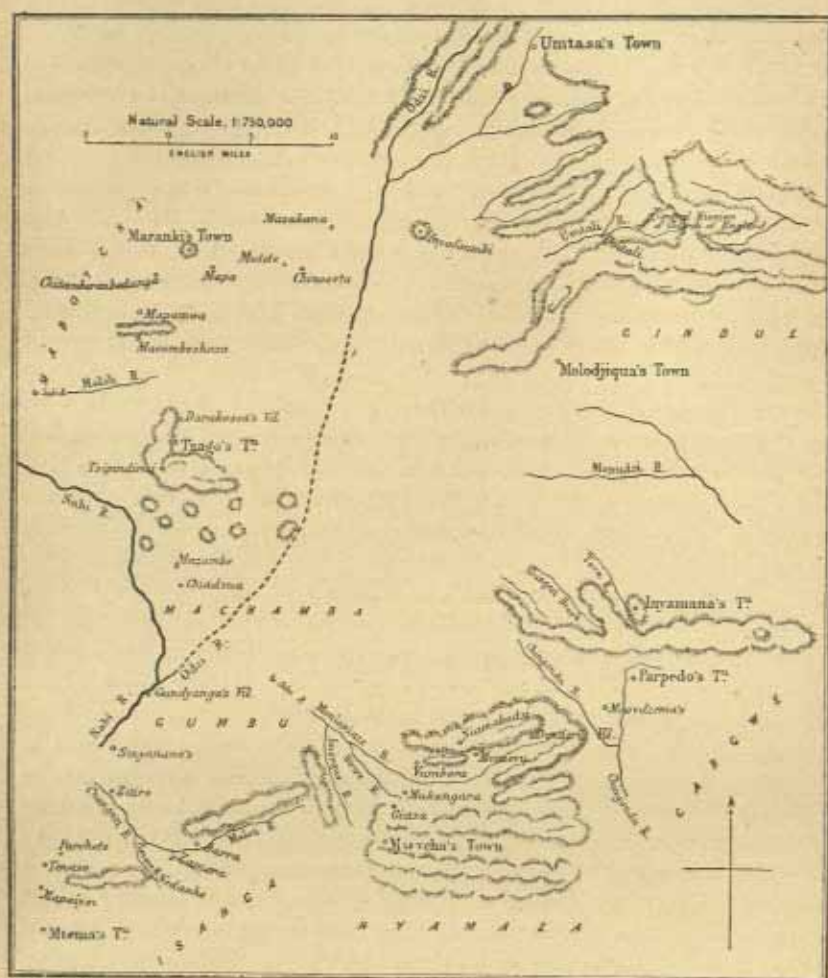
We gather from the latest account that the recent fight was at Taliche, and not at Chilas itself. However, it seems that we are in possession of the Chilas village. It therefore now appears not only possible, but an urgent measure to connect Gilgit with Abbotabad by means of a road *via* Khagan, thus saving some ten to fourteen marches. Besides Chilas, there are other valleys of the Shinaki country which have at one time or another been brought under subjection by the Dogra troops. These are on the right bank of the Indus Darel, Hodar, and Gor; but viewing the lightness of the bond—there being no troops or officials resident—they are always ready to make common cause with Chilas.

Between the Black Mountain and Nanga Parbat the country is sealed to the explorer, and the map shows topography in this direction at a standstill.

THE COUNTRY EAST OF THE JUNCTION OF SABI AND ODZI RIVERS.

By the Right Rev. G. W. H. KNIGHT-BRUCE.

THE accompanying map represents little more than a route-survey made by me during a walk through the country to the south of Umtali. The



interest lies in the ground apparently never having been mapped before. In character it is much the same as the corresponding country on the north of the Mashonaland plateau, but far more beautiful, and apparently far more fertile. Some parts of the country are quite the most beautiful that I have seen in Africa, and the natives seem fully alive to the

capabilities of the ground. The position—between the Matabele and the Gaza people, and at some distance from both—may have saved them from hostile raids and the destruction of their labours; and this may account for the very large herds of cattle that are seen in the neighbourhood of the villages along the River Sabi. The people consist of many tribes. In this especial walk I passed seven. Their occupations are somewhat different to the people on the uplands. They are fishermen; they get salt from their salt pans and rivers; in places their customs seem affected by the coast people.

The trees and general herbage seem much the same as in the Zambesi Valley, in some of the lower ground the sickly-looking yellow "fever-tree," as it is called on the East Coast, being very common. The baobab grows in as great profusion as in the Zambesi Valley.

A marked feature of the country is the succession of small valleys in much of the country to the east of the junction of the Odzi and Sabi, the path going for miles over a succession of saddles and through small valleys, a feature I have not seen in any other part of Mashonaland. The nights here in August were hot and sultry, while in Umtali they were cold and bracing. Though the people were very hospitable, I should say that the country of higher Mashonaland, *i.e.*, the country to the north and west, was more fitted to Europeans.

NOTE.—The map is a reproduction, on a reduced scale, of Bishop Knight-Bruce's sketch-map, adapted to Mr. Swan's positions and survey as published in the R. G. S. *Proceedings*, May, 1892. All the remainder of the map contains entirely new work.

A GERMAN COLONIAL ATLAS.*

THE great extension of the colonial possessions of Germany during the past few years has been so rapid, that the necessity for some such atlas as that which has now been published by the well-known firm of Dietrich Reimer, is fully recognised. The maps have been prepared under the superintendence of Dr. Richard Kiepert; they are five in number, and consist of a map of the world on Mercator's projection, showing the colonial possessions of European Powers, with smaller maps to illustrate the extent of the German consular and diplomatic services, and the lines of German mail steamers. This is followed by maps of Western Equatorial Africa, with an inset on an enlarged scale of the Cameroons; German South-West Africa; Equatorial East Africa,

* Deutscher Kolonial Atlas, für den amtlichen Gebrauch in den Schutzgebieten, von Richard Kiepert. Begleitender Text von Dr. Joseph Partsch. Berlin, 1893. Geographische Verlagshandlung. Dietrich Reimer.

with an inset plan of Dar-es-Salaam; and the German possessions in the Pacific Ocean. All of these maps are fine specimens of cartography, and, having been carefully brought up to date, are valuable, not only as showing the extent and position of the German colonial possessions, but also for general purposes of reference with regard to any country within the area they embrace. The letterpress which accompanies the maps is by Dr. Joseph Partsch, and contains statistical information and notes on the climate, products, &c., of each of the countries over which the German sphere of influence extends, whilst the value of the atlas is increased by the copious index with which it is supplied.

BRAZILIAN EXPLORATION IN THE AMAZONS VALLEY.

THERE exists at the Aix Seminary, in the French department of Bouches-du-Rhône, a Latin manuscript containing the description and itinerary of an ancient journey performed by Jesuit missionaries from the River Orinoko to the River Plate, through South America. Father Nicolino, a Brazilian, while studying at Aix, found, in the document referred to, the description of vast plains to the south of the Tumuk-Humak Range, and of British, Dutch and French Guiana, in the Amazons Valley. In this manuscript a tribe of White Indians is spoken of, which was also found there by Monsieur Coudreau in 1885.

Guided by the Aix Manuscript, Father Nicolino started on November 20th, 1876, from the Lower Trombetas or Oriximina, the affluent of the Amazons above Obidos, got a view of the plains at the base of the Tumuk-Humak on January 25th, 1877, but did not find any Indian village, and had to turn back for lack of provisions. He tried to return the following October traversing the forest, but was again obliged to retrace his steps. In 1882, whilst engaged in a third expedition, Father Nicolino died of yellow fever.

The River Trombetas, beyond the confluence of the Kuminyan, is very little known. Within the last twenty years some five or six expeditions, besides those we have mentioned, set out from Obidos to explore it, but never returned. The River Trombetas appears to be formed by the confluence of two considerable systems, one to the north-west, the other to the north-east. The higher system, that to the north-west, was explored in 1885 by M. Henri A. Coudreau, starting from the Rio Branco (confluent of the Rio Negro). The farthest branch is, in this direction, the Kurukuri. An affluent almost parallel with the Kurukuri, the Apiui, connects the Trombetas, and therefore the Amazons Valley, with the Essekibo, which runs northward, and, as is well known, discharges near Demerara, as in like manner the Rio Negro, the next largest affluent of the Amazons, communicates, farther west, with the Orinoko, by means of the Casiquiare.

In 1890 a vast overflow of the Amazons devastated the plains whereon the cattle of the Obidos district are reared. The government of the Brazilian province of Pará thought, at that time, to re-discover the means of communication with the plains found in ancient times by the Jesuits, and it dispatched an expedition under the engineer Gonçalves Tocantins. On October 6th, 1890, the expedition set out from Obidos to reach the mouth of the River Trombetas, ascended this river as far as the mouth of the Kuminyan (the Portuguese, Spanish and Brazilian orthography is *Cumina*, *Cuminhan* and *Cumind*). The first section of the Kuminyan is of almost

impossible navigation on account of the rocks and waterfalls, whereon the expedition's canoes were broken up. They then journeyed through the forest until able to construct a canoe from the bark of the Tapari tree. In this they travelled by way of the Urukuriana (an affluent of the left margin of the Kuminyan) for a period of ten days. The banks of that river are covered with dense forests, and colossal trees which had fallen across the stream had frequently to be cut away with hatchets to enable the expedition to advance. As fever began to assert itself, the expedition returned as far as the Kuminyan, which it continued to ascend. Then it was that, on the left bank, they saw an Indian village, the inhabitants of which fled as they approached. The expedition left presents for them and withdrew. When it returned the presents had been secured, but the Indians continued hidden. In the village there were tools, evidently obtained from the Dutch colony of Surinam to the north.

On November 28th the expedition at length arrived at the sought-for plains. Adjoining the Kuminyan, and rising 1300 feet above it, was a hill, from the summit of which could be seen grassy plains free of forest for a great expanse. To the north the Tumuk-Humak Range was seen to stretch east and west; to the south the forests extended as far as the Amazons, and eastward the plains seemed boundless.

Senhor Tocantins judges them to stretch as far as the Rivers Aporuna, Arapuari, Ausapá, and Oyapok, that is, as far as the slopes whence rivers flow direct to the Atlantic. Westward, also, the confines could not be discerned, and Senhor Tocantins believes the plains to stretch beyond the Rio Branco. On these highlands several treeless but grassy hills rise. The entire plateau is watered by numerous streams. At this point the Kuminyan is 820 feet wide, and is perfectly navigable, being intercepted by no waterfalls. At the period of Senhor Gonçalves Tocantins's journey northerly winds were prevalent, the climate was temperate and, to all appearance, salubrious. The plains appeared to be suitable for the rearing of enormous herds of cattle.

THE GEOGRAPHY AND SOCIAL CONDITIONS OF THE IBERIAN PENINSULA.*

By Professor THEOBALD FISCHER.

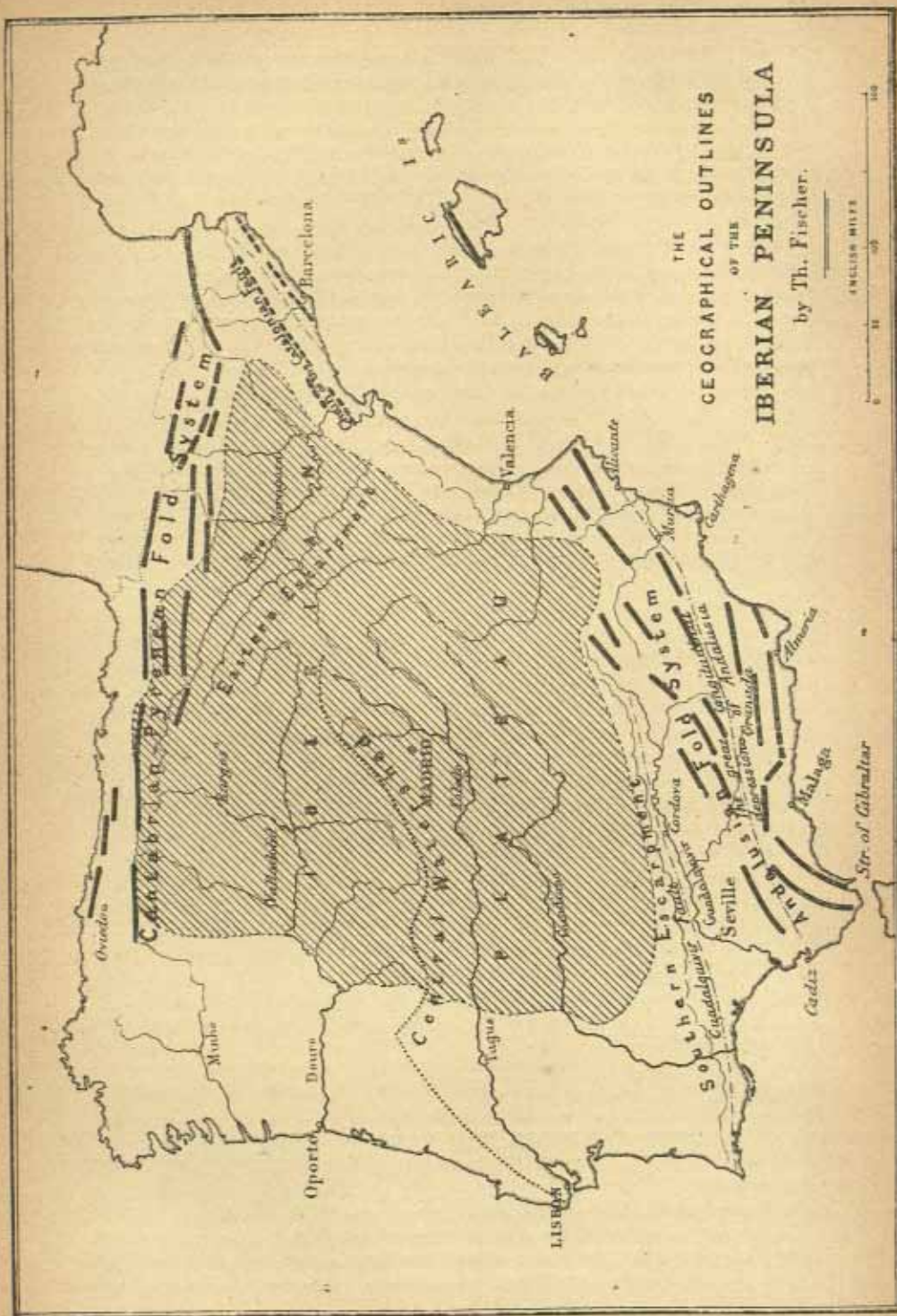
THE Iberian Peninsula is a region of contrasts, and although it is surrounded by the sea for seven-eighths of its borders, it possesses in the main the features of a country having little connection with the ocean, and a climate which, although wonderfully varied, is preponderatingly continental, in spite of the fact that the country only extends over eight degrees of latitude. The peninsula includes districts with a rainfall as great as any in Europe; with forests and meadows green in summer; the inhabitants of which drink cider: and also regions with a smaller rainfall than any in the world, where a harvest is only possible with the aid of artificial irrigation, and where the sugar-cane and date-palm flourish close beside the most fiery wines. Shut off from the outer world the peninsula, by virtue of its surface formation, possesses such marked contrasts in landscape with corresponding economical and ethnical contrasts, that it appears incapable of being welded into a political unity. The principal physical characteristic of the peninsula is the Iberian

* Report of a paper read before the Geographical Society of Berlin on March 4th, 1893.

table-land, which is composed of archæic and palæozoic rocks, and which at the end of the carboniferous period was "folded" together into a gigantic mountain-range of Alpine character, of which to-day only the ground-work remains. To this have been added later two formations, widely different in plan and style, viz., the Andalusian "fold" system in the south and the Pyrenean-Cantabrian in the north. It is almost as if two side-wings had been added to an old regular Doric temple in the shape of two elaborate Gothic domes. The precipitous and narrow coast border which has no adjacent islands or opposite coasts, and the shallow highland streams of which do not afford any means of communication with the interior, is unable to produce a good sea-faring population, except in Catalonia and on the Balearic Islands. The maritime trade has been naturalised by the outside aid of Genoese ship-builders and seamen. As early as the beginning of the fourteenth century the nautical training of the people was systematically taken in hand by far-sighted rulers in Portugal with the assistance of Italian captains and pilots.

The high central region, which is almost completely encircled by mountain walls, exercises in summer an influence through its heat upon the climatic conditions of the whole peninsula, and gives the latter in short a tone which reminds one of Asia. The districts situated on the edge of the peninsula, with the exception of these in the south-east, viz., Valencia and Murcia, have a maritime climate, while the interior regions have a continental climate, a hot summer, a cold winter and excessive drought. These climatic contrasts serve to intensify those of the surface formation. In the outer territories where the rock formations are more diverse, the well-fed rivers and streams have an extraordinary power of erosion, owing to the steepness of the mountain slopes; in all directions the country is intersected by deep, narrow valleys; the relief of the land is so full of variety that, for example, in Asturia, the surveyors found great difficulty in securing a level tract $\frac{1}{2}$ mile long for measuring a base for the triangulation of the country. On the tableland, on the other hand, there is but little erosion, owing to the small rainfall and the very slight variations of level; this region is a series of monotonous plains, over which one might, as in La Mancha, travel for hundreds of miles without varying one's height above the sea-level more than 150 feet. In the outer regions there are murmuring brooks, green meadows, cool forests of beeches, oaks, ashes, chestnuts, and fern-covered rocks overgrown with ivy; in the interior we find shallow, sluggish streams, which possess no eroding power, and at times lose themselves in swamps. On every piece of rising ground are mounted the classic windmills of Don Quixote by way of compensation for the want of water power; in some places there is a complete absence of trees, and the bare gypsum and salt steppe prevails; in others the plain is covered with low thickets, which although poor in foliage, can boast of fragrant and beautiful flowers. These contrasts are found generally so close to each other that their effect is all the more striking.

The marginal districts are everywhere the seat of a flourishing agriculture which has reached a high state of development, but which, being carried on mostly with the hoe, on the numerous small properties or farms, partakes rather of the character of gardening; in the coast territories along the Mediterranean a wonderfully developed system of artificial irrigation is very largely employed. The diversity of the vegetables cultivated, the abundance of fruit-trees of the most varied kinds, give one the impression that the country is one huge garden, and stamp the outer regions of Catalonia, as far as Andalusia, as a garden of "Huertas." The attention paid to manuring the soil with every kind of refuse obtainable reminds one of China. In Murcia the irrigated territory is thirty-seven times greater in extent than the non-irrigated; the value of the land is as much as £16 an acre, while for orange gardens in the coast plains of Valencia £300 to £400



and even £500 is paid. In view of such prices of land the population of these outer regions can hardly be charged with laziness and backwardness. The worker, as a small farmer, receives a very small portion of the result of his labour, and he lives often in a lamentable state of poverty opposite to the magnificent estate of his landlord in the most luxuriant Huertas. In these purely or chiefly rural provinces one is not surprised to find that there have already been socialistic disturbances.

Among the articles of export from Spain, vegetable products easily occupy the first place; they comprise about 66 per cent. of the total exports. But the border regions contain other treasures. As the Phœnicians, and after them the Carthaginians and the Romans filled their treasure-chests here, so to-day the peninsula is once more one of the first mining countries in the world, and is surpassed by none as regards the variety of its mining products. The treasures of America caused the mineral wealth of the peninsula to sink into oblivion for a time, but the foreign spirit of enterprise and foreign money and skill have once more brought Spanish mining into a flourishing condition. The £5,200,000 to £6,000,000, which represents the value of the annual output of Spanish mining products, comes almost exclusively from the regions on the borders of the peninsula. Spanish industry has in the same way its centre exclusively in these districts, where it receives great assistance from the water-power at hand. The economical weight of Spain lies in its peripheral parts; all the large cities of the country, with the exception of Madrid, are situated in the border regions, which although occupying only 45 per cent. of the entire superficial area of the peninsula, contains 66 per cent. of the population. The inhabitants of the central districts carry on agriculture and cattle-rearing exclusively, limited, however, almost entirely to the cultivation of wheat and sheep-breeding. The settlements in this part of the country possess no attractive features, not even a strip of garden ground. They are situated in the bare plains, often at a distance of from 12 to 18 miles from each other. These towns are in hardly any case wanting in historical interest and in attractive buildings, but in all directions the evidences of decay are seen; for instance, entire streets or a whole quarter will be found in ruins; it is almost only in the capital that new buildings are seen. Wide stretches of country, covering thousands of square miles, lie waste; to the south-west of Toledo, for example, a whole province of about 2000 square miles is completely uninhabited—the notorious Desplados. Everywhere one finds stagnation, retrogression, desolation, depopulation, so that it may well be doubted whether the assertion of a Spanish patriot that Spain is the richest country in the world, because the Spaniards had been endeavouring for three hundred years to ruin it without having attained their object, is still correct. The great contrasts in the nature of the country are expressed also in the political geography, because at no time, except as a member of the Roman Empire, has the peninsula been politically united. Portugal, as the most independent and individualised of the outer territories, has managed to preserve its independence to this day.

THE LAKES OF THE EASTERN ALPS.

SEVERAL papers by different writers have recently appeared descriptive of the lake-basins of the Austrian Alps, with special reference to their mode of origin.

In the *Mittheilungen* of the Vienna Geographical Society (xxxv., p. 471), Josef Damian gives the full results of his investigations into some of the Alpine lakes in the neighbourhood of Trient. The greater number of these belong to

the class of obstruction lakes originated by the formation of a dam across a valley, though rock-basins also occur. The lakes of Cavedine, Toblino, and Santa Massenza, in the valley of the Sarca, the feeder of Lake of Garda, are good examples of the first class. The three lie at the eastern side of the valley, separated from the river by a vast field of *débris* over 320 feet in thickness, which fills the whole valley for a distance of $4\frac{1}{2}$ miles. The Lake of Cavedine, which is drained through this *débris*-wall into the Sarca, is separated from that of Toblino, which drains into it by a plain $2\frac{1}{2}$ miles long. Exactly opposite this plain the Sarca breaks by a transverse valley through the mountains, and were it not now confined by walls, would continue to raise the level of this plain by depositing its sediment on it. The two upper lakes, originally one, have been separated in recent times by the deltaic deposit of a side stream. The general result of soundings in these and other lakes is to show that the inclination of the bounding walls is the same below and above the surface. The side walls as a rule fall steeply into the lake (often to a nearly level bottom covered with mud), while at the ends the slope is more gradual. The steepest slope occurs, in the Lake of Cavedine, on the side of the *débris*-wall, the loose materials being continually undermined by the waves.

This *débris*-field in the Sarca valley, like the better-known but smaller one in that of the Adige, has been the subject of much controversy. From the traces of glacier action found, Paglia and Amboni pronounced it to be a terminal moraine. Damian, however, supports the view that it is the result of a vast landslide. Signs of glacier action are common in the whole district (in fact they diminish as one approaches the locality in question), and would naturally be found in the *débris* of a mountain side; besides that, real moraines may exist beneath the fallen materials. The fact that the materials are more crushed below, while large, sharp-cornered blocks are found above, the piling up of the *débris* on the side away from that whence they fell, and the poverty of vegetation, are all characteristic of landslips, while the places from which the masses have fallen away are plainly visible on the side of Monte Casale.

The romantic Lake of Tovel, 3820 feet above the sea, situated in a deeply-cut, wooded valley in the Brenta group, and that of Tenno near the head Lake of Garda, are both dammed back by undoubted landslips. The outlet of the former, like that of the Lake of Molveno, flows for some distance beneath the masses of rock which form the barrier. Examples of rock-basins in the district are found in the Lake of Teriago, and two others enclosed in a deep valley without outlet on the mountain of the same name. The former occupies a hollow above the pass of Cadine, the outer edge of which falls steeply to the Adige. The shores sink gradually to the water, Jurassic and other strata with a gentle westerly dip, being exposed to view in many places. Common report has it that the water passes underground to the Adige, coming to the light in some springs at the foot of the slope in that direction. The existence of such a connection is possible, in spite of the westerly dip of the strata, as the latter are much disturbed to the east of the lake. Were the water to rise until it overflowed the rim of the basin, it would take a course towards the Sarca. The formation of this and the other basin mentioned, by glacier action, is out of the question. It is rather due to the mountain structure itself, this region being traversed by an important line of fault. An example of a lake in undoubted connection with glacial phenomena, is that of Ledro, dammed back in an elevated valley west of the Lake of Garda, into which its outlet pours by a fine fall. The lake has an irregular outline, and its shores fall steeply down to extensive level bottom. Its former greater extent is shown by the remains of terraces higher up the valley, and by the depth to which the effluent has cut down into the barrier.

The direction taken by the ice to which this result is due, is, however, a disputed question, some holding that it was a branch of the Chiese glacier, which came over the pass of Monte Giovo down the Ledro valley to join the Adige glacier; others, that a part of the latter took a westerly course to join that of the Chiese. Damian thinks the latter more probable, owing to the greater importance of the Adige glacier, which seems to have filled the valley to a higher level than the other. The Ledro valley is, besides, more accessible from the east in spite of the narrow ravine at its mouth, the pass of Monte Giovo at its upper or western end being over 4000 feet above the sea. The arrangement of the materials in the dam also favours this view, the layers sloping more or less towards the lake.

The lake-basin of Andalo is held to be an example of one hollowed out, at least in its present form, by glacier ice.

In a recent number of the *Zeitschrift* of the Berlin Geographical Society Dr. Fritz Frech gives a very full study of the south-western Carnic Alps and the valleys of the Gail, Drave, and Fella-Save from the historical or geological point of view. Starting with the elevation of the Triassic rocks between Permian and Jurassic times, the lines of the most important valleys are shown to have been determined, subject of course to the limitations imposed by gravity, chiefly by the main lines of faulting, and their erosion to have taken place under climatic conditions markedly similar to those of the present day. The transporting action of glaciers is evidenced in the general removal of *débris* formed by weathering during that period from the central districts and its deposition at the outskirts of the mountains. The area surveyed derives, however, more general interest from the examples it presents of what the author regards as the direct erosive action of ice in forming "glacier-pots" (Karen) and inland lakes. The former are most frequently met with in the transverse-valleys of the Upper Lessach, usually at the higher end, cut out of the slate, although the most typical specimen, the Rosskar, is in quartzite. Such fresh data regarding these formations are specially valuable in view of Blümcke and Finsterwalder's researches on the chemical erosive action set up by changes of pressure under ice. Dr. Frech classifies the numerous lake-basins in the surveyed area into rock-basins, lakes formed by hollows on the surface of moraines, and those in which the glacial deposit merely acts as a dam. In all the larger rock-basins—the Wolayer, Strucken, Kartitsch, and Obstoanser lakes—the rotational or digging action is due to a peculiarity of formation—either faulting, or a change in the nature of the rock, and it seems probable that in some cases pre-glacial erosion accentuated these peculiarities, increasing the subsequent glacier action. Smaller lakes occurring on ridges and plateaux must be ascribed entirely to the ordinary movements of the ice, the constraint necessary for rotational action being absent. The lake-basins forming through damming, chiefly by terminal moraines near the close of the glacial period, are now mostly filled up, and the deposits cut into by streams—indicating a considerable lapse of time since their formation. Two somewhat peculiar cases may be noticed, in which the dam is at the upper instead of the lower end of the lake. The Presseker Lake, near Hermagor, and another near Draschitz, have been formed by the moraine deposit from another valley blocking a stream and forcing it to seek a new outlet, which has been found at a level lower than the top of the moraine. The latter part of the paper treats in detail of the action of post-glacial agencies in modifying the contours of the country, and includes a description of the effects of the great landslide on the southern slopes of the Dobratsch in 1348.

On the northern slopes of the Alps the lakes of the Salzkammergut have been mapped under the direction of Dr. A. Penck and Dr. J. Müllner of the Geographical

Institute of Vienna University, and a recently published work on 'The Lakes of the Traun Region' summarises the results.

The soundings made in 1806 in the Bavarian lakes, and in 1812 in the Traun lakes, could not overthrow the current belief in the unfathomable depths of most Alpine lakes. They were too isolated, and not being followed up were soon forgotten. Since 1845 Friedrich Simony undertook the careful exploration of the depths and temperatures of all the lakes of the Salzkammergut. He continued his explorations for forty years, and thus became the founder of the special branch of science termed by Forst, *Limnology*, or the scientific study of lakes. His figures relative to the depths of the Salzkammergut lakes are always referred to in scientific literature as thoroughly trustworthy.

Dr. Müllner has now utilised the mass of numerical data collected by F. Simony for the construction of maps of those lakes. All these maps are drawn on a uniform scale of 1:25,000, and show contour lines at every 10 metres (33 feet) of elevation above the sea—like the maps of lakes in the topographical atlas of Switzerland. The whole has been done with the accuracy required by this sort of work. The configuration of the bed of these lakes, which is all-important in speculating as to their origin, thus appears with the greatest clearness. Profiles are also given on the same scale. Several of the higher Alpine lakes have been explored by Dr. Müllner, and altogether thirty-five of the lakes of the Traun region are mapped. Five of them lie at altitudes of from 1312 to 1640 feet; twenty-one have altitudes of from 1640 to 3280 feet; four from 3280 to 4920 feet; and six are situated above the level of 4900 feet. The following figures relative to some of the best known lakes, are extracted from the general table in which all the sheets of water so far surveyed are recorded:—

	Height of Surface above Sea-level in Feet.	Area in Square Miles.	Greatest Depth in Fathoms.	Average Depth in Fathoms.
Traunsee	1384	8.75	104	49
Attersee	1525	17.75	93	46
Mondsee	1571	5.40	37	20
Hallstätter See	1620	3.25	68	36
Wolfgang See	1768	5.00	62	25
Fuschlsee	2168	1.00	37	20
Vorderer Lahngang See . . .	5010	0.07	42	18

THE MONTHLY RECORD.

THE SOCIETY.

The Session After Easter.—The first ordinary meeting of the Society after Easter will be held on April 24th, when the Hon. George Curzon, M.P., will read a paper on some of the geographical results of his recent visit to French Indo-China. On May 8th, Mr. W. M. Conway will give an account of his expedition to the Karakoram Mountains. It is hoped that the paper following that will be by Lieutenant Peary of the U.S. Navy, describing the results of his recent expedition to North Greenland,

and the plan of his proposed expedition for the exploration of the North Greenland coast.

The Oxford Geographical Studentship.—The Electors appointed by the Royal Geographical Society and the University of Oxford have elected to the annual Geographical Studentship, instituted jointly by the two bodies, Mr. W. H. Cozens-Hardy, B.A., of New College, who has, under the direction of the Council, taken the eastern frontiers of Montenegro as his field of research. Mr. Cozens-Hardy has the advantage of having had already some experience of travel in the region in question, and of a knowledge of the language spoken; he may be expected to collect much interesting information concerning a district which is still very imperfectly represented in maps, and has never been thoroughly investigated.

The Society's Educational Lectures.—The last of the series of ten educational lectures by Mr. H. J. Mackinder was given on March 24th. The success of this first series has been so satisfactory that the Council will probably be encouraged to continue the lectures in future years. Mr. Mackinder's course, of which the first series has just been concluded, is intended to cover three successive years. The arrangements for next year will be duly announced.

The Annual Dinner.—The annual dinner of the Society will be held on Saturday, May 13th, at the Whitehall Rooms of the Metropole Hotel. It was impossible to obtain the rooms for the evening of the anniversary meeting, May 29th. Full particulars will be found in the usual Society 'Notices.'

EUROPE.

Survey of Greece by Austrian Officers.—The survey of Greece which was begun in 1889 by the officers of the Imperial Military Geographical Institute, under the management of Lieut.-Col. H. Hartl, is already so advanced that the triangulation-net has been extended over the whole Kingdom. This year, a detailed topographical survey of Thessaly, which was begun in 1891, will be continued. At the same time, the Academy of Sciences sends out the geologist Hilber and the botanist Eugen von Hallaci for the exploration of the yet unknown highlands of North-West Thessaly. The botanical exploration of this province is the more desirable, as what is already known of the flora of Thessaly shows that it differs greatly from the general flora of the Balkan Peninsula. A young botanist will also be sent to Albania, in order to study the distribution of the Alpine flora. Interesting results are expected from these researches as well, the vegetation of the Balkan Peninsula generally offering a very original character.

AFRICA.

Memorial of Dr. Livingstone in Africa.—In January, 1889, the Council of the Royal Geographical Society voted a sum of money as a reward to the chief Chitambo, in whose territory Dr. Livingstone died, as a recognition of his ready permission for the removal of the great traveller's body. The money, intrusted to the Rev. F. S. Arnot, of the Garenganze mission, who hoped to be able to convey the present to the chief, was employed in the purchase of presents consisting of cloth and other articles, including a double-barrelled gun and equipments, the importation of firearms not being forbidden at that time. The cloth purchased consisted of three hundred and eighty-six handkerchiefs, eight pieces double-width blue cotton, five pieces cretonne, four pieces velvet, and five pieces silk, the whole costing in London £29. On arrival at Lake Bangweolo it was estimated that its value exceeded £100, the augmentation being due mainly to the extreme uncertainty of transport so far from the coast. Mr. Arnot was also the bearer of a memorial tablet in bronze which was sent by Mr. and Mrs. A. L. Bruce of Edinburgh (the son-in-law and daughter of Dr. Livingstone), with the intention of fastening it upon the tree at Chitambo's under which the explorer's heart was buried. Two copies of this tablet were sent out, in order to reduce the risk of loss. Mr. Arnot brought the presents and the tablet to Bihé in Portuguese West Africa. After considerable delay and overcoming many difficulties, the missionaries advanced to Nanakundunda, about half-way between Bihé and Lake Bangweolo, whence Mr. Arnot's colleague, Mr. H. B. Thompson, marched to the Garenganze country with the presents and memorial. But he, finding that it would be impossible to reach the place, delivered over his charge to Captain Bia, of the Katanga Company's expedition, who very kindly agreed to alter his route, in order to give the presents to the chief who succeeded Chitambo, and to fasten the bronze plate upon Livingstone's tree. This was at last accomplished by Lieutenant Franqui, one of the officers of the expedition, and it is a matter for congratulation that after twenty years the spot in central Africa most hallowed by associations of the greatest of modern African travellers should be worthily commemorated. The inscription on the bronze plate is simply—

LIVINGSTONE

DIED HERE,

ILALA, MAY 1st, 1873.

Mr. Theodore Bent's Expedition to Aksum.—Mr. Bent writes as

follows to the Secretary, under date, Adowa, February 19th, 1893:—
“Probably you would see the difficulties that confronted us on landing at Massowa—namely, the war between Ras Alula and Ras Mangascia, which rendered it absolutely impossible for us to enter Tigrè. In fact at that time it looked almost hopeless, and we nearly decided to go off to Suakim, but the Governor encouraged us to wait a few weeks; so to pass the time we made excursions in the Italian colony to Keren in Bogos, and to some of the approachable Abyssinian convents, which time was really very well employed, though not producing any satisfactory archaeological results. At last we got notice that Ras Alula had been beaten, and that Ras Mangascia would send an escort to meet us at the Mareb; so we came on as quick as we could with a huge caravan of people who had not been able to get before, and reached Adowa just a week ago. I have sent on a handsome present to Ras Mangascia to Makalle, where he at present is, and asking permission to do what I like at Adowa, which I hope may be granted. Meanwhile I have been examining the neighbourhood of Adowa from an archaeological point of view, and I think our first efforts have been very successful. Up in the mountains, about 12 miles from here, we have discovered an ancient Himyaritic temple, identified this time by no less than seven inscriptions. This is very satisfactory to begin upon, and I hope to visit one or two more sites near here before going to Aksum. If all goes smoothly, which, by the way, is doubtful, and we know not which day we may not have to pack up and be off, we hope to spend several weeks in Aksum, and the smoother things go the longer we shall stay, perhaps not reaching England before the beginning of June.”

The Course of the Lukuga.—The surviving members of the expeditions under M. Delcommune and Lieutenant Bia, which were recently engaged in explorations in the South-Eastern Congo Basin (see *Geographical Journal* for last month), are reported to have arrived at Leopoldville on February 5th. Captain Bia died at Bunkeya, but one of his officers, Lieutenant Franqui, succeeded in reaching Dr. Livingstone's grave. M. Delcommune left Mrumbi on the Tanganyika on October 15th, traced the Lukuga to Lake Lanji, and travelled thence to the port of Lusambo on the Upper Sankuru, whence the *Roi des Belges* conveyed him down the Congo. The only representative of the Congo State still remaining in the old kingdom of Msidi appears to be Lieutenant Legat, who occupies the fort built by Captain Stairs at Bunkeya. After M. Delcommune's very successful journey, the fact of the Lukuga being an outlet of Lake Tanganyika is no longer open to the slightest doubt. Commander Cameron, who discovered that river in 1879, and followed it for about 4 miles, found it blocked by vegetation, but observed a decided current setting out of

the lake, and was told by the natives that it reached the Lualaba.* Mr. Stanley, in the following year, travelled about 5 miles beyond Commander Cameron's furthest, and found that a sand-bar cut off all connection between the lake and the basin of the Lualaba, but predicted that a small rise of the lake would suffice to sweep away this barrier.† The rains during 1877-8 were exceptionally heavy, the lake rose rapidly, and Mr. Stanley's prediction was fulfilled. Mr. E. C. Hore in 1878 found the Lukuga to flow out of the lake,‡ whilst Mr. Joseph Thomson, in 1879, describes it as "unusually free of all vegetable obstructions," and as "sweeping along between clearly-cut banks and in a deep channel."§ When Major von Wissmann visited the Lukuga in 1882 it still flowed out of the lake, and so it did during his second visit in 1886, although the level of the lake had fallen four feet in the interval.|| As the fluctuations in the level of the lake exceed 16 feet, a time must come when the Lukuga shall no longer be an outlet, unless indeed Major von Wissmann's suggestion, that the level of the lake be regulated by building a lock across its debouchure, be acted upon.

The Northern Interior of the Cameroons.—Notes on a journey made by Lieutenant von Stettin to the recently-founded station of Baliburg, about 180 miles north-north-east of the Cameroons estuary, appear in the *Deutsches Kolonialblatt* for January 15th last. From the station of Mundame, on the Upper Mungo, the caravan track leads through (1) the forest-land; (2) the Banyang country; and (3) that of the Balis, in which the station is situated. The inhabitants of the first zone are peaceful and industrious, and seem inclined to trade. They retire, however, before the overbearing Bali traders who pass through their district. The Banyangs are more respected by the latter; but their want of union prevents their forming the barrier that could be wished against the encroachments of the Balis, who, having been armed, may become a source of danger to the colony. These last show an extraordinary eagerness for European goods, and are the most active traders of the country, even acting as middlemen between the other tribes and the coast. They seem untrustworthy as porters, but might be useful for temporary service as troops. Many of the clearings in the forest belt have been abandoned, but not for want of a fertile soil; the Banyang country, on the contrary, is a perfect garden. Indiarubber and elephants abound; poultry, sheep, and goats are plentiful, and fine

* 'Across Africa,' p. 226.

† 'Through the Dark Continent,' ii., p. 52.

‡ 'Tanganyika,' pp. 113, 147.

§ 'To the African Lakes and Back,' ii., pp. 58, 66.

|| 'Unter Deutscher Flagge,' p. 224, and 'My Second Journey through Equatorial Africa,' p. 255.

cattle are seen in parts of the forest zone. Several firms have opened factories on the road. Calabar, however, diverts a part of the trade; and, in Von Stettin's opinion, the nearness of the Benue will stand in the way of the expansion of German trade in the northern parts.

The Change in Level of the African Lakes.—Dr. R. Sieger, of Vienna, has recently critically examined (*Globus*, vol. 62, No. 21) the various statements of African explorers concerning the different levels of many African lakes. His careful collation of African literature of the last forty years has led him to the conclusion that at present the levels of the principal lakes in that continent are falling. He attributes this principally to climatological changes, and assumes that the levels of the lakes sink and rise in certain recurring periods. In some cases this is no doubt correct, but on the whole the areas of the lakes are becoming less; a fact which is probably due not only to climatological, but also to geological influences, partly local, and partly general.

NORTH AMERICA.

Irrigation Value of Snow in North-West America.—Professor Ratzel has a note in the January number of *Peterman's Mittheilungen* on the importance of snow as natural reservoirs for irrigation purposes on the elevated and poorly-watered tableland of western North America. In all this region winter is the wet season. The absence of summer rains after June and July is one of the chief conditions of the existence of the "fertile belt" of corn-growing country which stretches up to Manitoba. This contrast is markedly illustrated by the results of observations in eastern Oregon and Idaho, which are characteristic for the northern part of the region referred to. There we find that 66.6 per cent. of the moisture falls in the winter months (November to March), while the summer months (July to September) have only 5.9 per cent. Montana exhibits a somewhat different type, as in this state we find the earlier summer with the greatest proportion of moisture (over 33 per cent.). Further south December to March are the months of greatest moisture; on the eastern slopes of the Sierra Nevada an increase in altitude of 500 or 600 feet often means double or triple the amount of moisture. In the combination of these two facts—the increase of moisture with altitude, and the prevalence of winter rains or snow, lie the conditions which alone can make the region referred to habitable and capable of successful cultivation, and the great importance of the slowly-melting snow of the uplands is therefore apparent. In the case of Nevada the rivers bring down 75 per cent of their average annual water supply in April, May, and June, while nearly two-thirds of the annual moisture fall in the winter months. The rivers of Wyoming, Montana, and Oregon exhibit similar conditions. As a rule it will be seen that the rivers are fullest three months after the period of the maximum precipitation. True, the low temperature of the snow-water may sometimes injure the young plants, but not appreciably more than does the saline matter absorbed by the rain in its passage through the soil of the Steppe. Rivers which have their sources at considerable altitudes are therefore of great value to the irrigator, as the snow from which they derive their supply melts more slowly. Here Wyoming has the advantage of Oregon. An early summer is bad, as the snow melts quickly. A late snowfall is not much better, as the snow has no time to get

hard, and so disappears rapidly when summer sets in. The most favourable conditions are a heavy snowfall in the early winter, as this supplies a reservoir that absorbs and preserves any moisture that may fall later on. Frost too plays an important part; it appears that if the snow falls on soft, unfrozen ground its moisture is absorbed and preserved for future use, while if the ground is frozen, a much greater quantity of the snow is melted by the sun and finds its way into the rivers at a time of year when it is not wanted. A report from Northern Oregon ascribes the good harvest of 1885, and the failure of the crops in 1888 to this fact. Deforestation, here as in other parts of the world, is a danger to the farmer, the woods tending to keep the snow together longer, and to protect it from the sun's rays.

AUSTRALASIA.

Ancient Glaciers of New Zealand.—In the second number of the *New Zealand Alpine Journal*, Capt. F. W. Hutton, F.R.S., publishes a short paper on the ancient glaciers of New Zealand, illustrated by a map. His conclusions are that at the time of their greatest extension the ancient glaciers of New Zealand were larger and descended lower the further they were south. The terminal moraines in North-west Nelson go to 2700 feet above the present sea-level; Lake Rotoiti, in South Nelson, to 2000 feet; Lake Sumner, probably (Capt. Hutton believes) a glacier lake, is 1700 feet above the sea. In South Canterbury the terminal moraines are 1000 feet, and in South Otago only 600 feet above the present sea-level. In Westland, and in the West Coast sounds, the glaciers advanced to below the present sea-level. The glacier of Boulder River was 4 miles, and that of Lake Rotoiti about 12 miles in length; the glacier at the head of the Waiau-ua, or Dillon, 14 miles; that of the Rakaia, 55 miles; the Wanaka Glacier, 60; that of Wakatipu, 80; and that of Te Anau, 65 miles in length. There is, therefore, a considerable difference in relative proportion between the ancient glaciers and their present representatives, as a glance at the map accompanying this paper will show. At present they reach their maximum in South Canterbury, and get smaller both to the north and to the south; while in ancient times their maximum was in Central Otago. This difference may, perhaps, be due to the Otago Mountains having then been relatively higher than they are at present. Or it may have been due to the great breadth of mountains, at present from 4000 to 7000 feet in height, in Central Otago which were probably covered with snow during the great glacier period.

German New Guinea.—Herr G. Schmiele, who has resided for five years in the German Australasian possessions, gives in *Nachrichten über Kaiser Wilhelms-Land und den Bismarck-Archipel*, an interesting report on the characteristics and capabilities of the new colonies in that region. New Guinea, from the scale of its natural features possesses quite a continental character, compared with the smaller islands of Java, Sumatra, and Ceylon. If recent reports be true, its culminating point is 15,000 feet high and covered with perpetual snow, while the outer ranges, where they do not fall steeply into the sea, are bordered by well-watered plains of rich deep alluvium. The most eligible of these, that of Astrolabe Bay, was chosen

as the field on which to concentrate the first efforts towards the development of the country. Herr Schmiele is very sanguine as to the prospects of the young colony. From a comparison with the three islands above mentioned, he finds that German New Guinea has the advantage in all the most important respects. Instead of the open roadsteads, swampy river mouths, or costly works, by which access is had to their coasts, it boasts of such excellent natural harbours as Friedrich Wilhelm Hafen, Alexis Hafen, and the like, while for fertility the older colonies with their more or less exhausted soil, are, with the exception of certain parts of Java, not to be compared with it. Although malarious in its present stage of development, it is, according to Herr Schmiele, no more so, perhaps less, than other tropical colonies have been, while besides fever, no other disease prevails. The distance from Europe is compensated for by the paying nature of its products. A more serious hindrance is the want of labour, for the natives are few and not disposed to work, while the mortality among those brought from the Bismarck Archipelago, and the expense incurred on them, prohibit their employment. In the islands of that Archipelago different conditions prevail. Their thinner coating of humus, their insular climate, and more moderate but more evenly distributed rainfall, their low elevation and exposure throughout to the sea breezes which allows the cocoa-nut palm to grow everywhere, mark them out at once as a field for the production of *copra* and cotton. Being well peopled by a race which is industrious and hardy, the labour question presents no difficulty. Herr Schmiele can say less about the Solomon Islands, though the well-watered heights of Bougainville give the appearance of being adapted for coffee cultivation. The treachery of the natives will render caution necessary in beginning operations here.

POLAR REGIONS.

Mr. F. G. Jackson's Proposed Polar Expedition.—In reply to a request to furnish information to the *Geographical Journal* on his proposed expedition to Franz Josef Land and Polewards, Mr. F. G. Jackson writes as follows:—"Readers of the *Proceedings* of the Royal Geographical Society will not need to be reminded of the great favour which has been shown to the Franz Josef Land route for future Polar exploration ever since the Leigh Smith expeditions of 1880 and 1881. The Franz Josef Land route is held to be, I maintain, the best of the routes open to the Arctic explorer. The objects I have in view in my projected journey may be conveniently summarised under two heads: 1. The general exploration of Franz Josef Land, and, in particular, the discovery and mapping of its northern regions; the observation of the climatic conditions encountered; the recording of such geological evidence as is met with; and the general investigation of the geographical conditions of the country. 2. An advance in a northerly direction which shall be so far continued as to bring me within the immediate locality of the North Pole, and an endeavour, by all means in my power, to observe the geographical conditions at that mathematical point. Speaking generally, my plan may be described as an advance northward on land as far as such land continues; an advance which shall be made more secure and more open to retreat by the establishment of a series of depots, reaching at intervals of

about 100 miles from about the parallel of 80° to the most northern point of the land, or the locality of the North Pole, whichever shall be met with first. I propose to utilise, in my northward march, a number of strong light sledges, and to employ dogs to drag them when feasible. I further propose to take boats on my land journey, but these boats will be of a special character, and very portable. I shall also have at least three whale boats. These, however, will be left at the original depot, established at or near our first landing-place. I shall take not more than ten men. It will be my endeavour to land either at Cape Flora or in Eira Harbour, or perhaps on one of the islands eastwards. This must depend to a great extent on the local conditions of ice this year. After we have been landed and have raised our first depot, we shall have for at least one year no further use for the ship which has taken us out. It might, however, be practicable to make a rapid reconnoitre northward, and return with some interesting results before the ship should be obliged to make south again. It is quite possible that we may find, in the summer of 1894, that our advance towards the immediate region of the Pole is either feasible or impracticable. Under the most favourable conditions—which I would assume to be the stretching of Franz Josef Land into the immediate regions of the Pole—we might achieve our objects and return to the southern shores of Franz Josef Land in the late summer of 1894. At any rate, by the summer of 1895, I think we should have proved whether the Pole is practicable or not by the Franz Josef Land route, and be in a position to return to Europe. Thus we require two years in which to attain all our objects or prove the impracticability of attaining one of them. In any case I shall endeavour, with all my power, to bring back a faithful report of the geographical conditions in a region of the Earth more northerly than any that has yet been observed or, indeed, reached."

Lieutenant Peary's Proposed Arctic Exploration.—Lieut. Peary, according to an authorised communication in an American newspaper, will start for the North about midsummer with the intention of spending two years in Arctic exploration. His party will not number more than ten, as Mr. Peary believes that the largeness of an expedition is an additional source of weakness, and that with a small party of picked men he is most likely to succeed in his undertaking. He intends to charter one of the St. John's whalers to transport his party, and he will form his winter camp on the north coast of Inglefield Gulf, a little to the east of last year's camp. The advantage of this change is the greater ease with which the party will be able to reach the great inland ice cap, and the saving of two weeks' hard work. The explorer hopes to reach his camp in the last week of July, and as soon as the ice is in condition for sledging he will set a party to work on a detailed survey of Inglefield Gulf, which is worthy of close investigation, as it is the deepest indentation on the coast, and its shore is diversified by many mountains. A party will also be sent out on the inland ice to carry supplies as far to the north-east as they can, where they will establish a *cache*, and so greatly facilitate Peary's movements at the commencement of next spring. Last year it was not until May 15th that a start was made with the sledges; but next year the explorer

hopes to begin early in March, and he intends to try the novel experiment of using donkeys or ponies to supplement his dog teams. Peary had conceived this idea before he heard of Glave's successful attempt to fit snow-shoes on horses. The expedition proceeding from the main camp to the north-east of Greenland will not exceed half-a-dozen men; on reaching Independence Bay three of the number will likely be detailed to survey the coast. The route to North Greenland will probably be a mean between Peary's outward and return routes last spring. A more southern outward track would, he hopes, avoid the great crevasses which so greatly obstructed his progress. On his more southern return journey when sledging along the ice-cap he was often at an elevation of 8000 feet, and travelling in fog and mist. By keeping more to the north than this he hopes to escape both the crevasses and the fogs. The purpose of the expedition is to determine the coast-line from Independence Bay to Cape Bismarck, for which work a party of three will be appointed; and to explore the Archipelago lying north of the mainland. It is possible that during the winter of 1894-95 Peary will camp further north than explorers have ever yet done. He will probably work round the eastern shore of the Archipelago until he comes to the point on the western coast reached by Greely. Peary has no theory as to the extension of this Archipelago towards the Pole; he hopes to map out the land and determine how far northwards it extends, reserving his final plans until the special circumstances of the case show him what is the best course to adopt. It is possible we may not hear news of the explorer until the summer of 1895, when a vessel will be sent to take his party home, but he may utilise the Eskimos as mail-carriers, and send home a package of letters in 1894, the experiment tried in this way during his last expedition having been successful. The expedition has been planned carefully in the light of earlier experience, and it is probable that good Arctic work may be done, and observations of value collected.

The Antarctic Whalers.—The arrival of the Dundee whaling fleet at the Falkland Islands in the beginning of December was mentioned in our February number, p. 172. From news recently received we learn that the vessels made a much shorter stay in the Antarctic ice than was anticipated. They returned safely to the Falkland Islands in the middle of February, and are now on the way home. The code telegram mentioning their arrival was unfortunately mutilated in transmission, and it does not appear whether the expedition was commercially successful or not. The scientific results cannot be very great, on account of the short stay in southern waters; and it is improbable that a high latitude was reached.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Total Area of Land on the Globe.—A. Oppel, of Bremen, has recently remarked in *Ausland* that the statistics on this subject vary considerably. For instance, in 1872 the area of land on the globe was carefully calculated to be 133,770,000 square kilometres (50,830,000 square miles), whilst in 1891 it was found to be 135,490,765 square kilometres. This difference of 1,720,765 square kilometres (654,000 square miles, about three times the area of the German Empire) how-

ever, according to Oppel, is due less to the changes of the coast-lines during this period of time than to fresh discoveries of land in the Arctic regions, *e.g.* Franz-Josef Land, Lincoln-Grant Land, and the most northern parts of Greenland; and to the more exact methods for ascertaining the areas of subdivisions of continents. B. Trognitz and General J. Strelbitsky have done good work in the latter respect, in ascertaining by planimetric computations the areas of Europe, Asia, Africa, and Central and South America. But many points are still uncertain, and Oppel is of opinion that several decades must elapse before we can arrive at any approach to a definite conclusion about the exact area of the land surface of the globe. The main source of uncertainty rests, of course, in the area assumed for the Antarctic continent, which is apparently left out of account in the estimates given above.

Distribution of Soil on Earth's Surface.—Dr. Alexis von Tillo has been investigating the distribution of various kinds of soil over the Earth's surface, with a view to ascertaining the area occupied by each. He bases his calculations on Sheet 4 of Berghaus' Physical Atlas. This map and Dr. Tillo's calculations deal with the six great classes of soil into which Baron von Richthofen divides the covering of the land-surface of the globe ('Führer für Forschungsreisende,' p. 498). In the classification of the submarine deposits, Murray and Renard's map is followed. The following figures, being a portion of two out of the six tables drawn up by Dr. von Tillo, will suffice to summarise the results of his investigations:—

1. LAND SURFACE DEPOSITS (PERCENTAGE).

—	Europe.	Asia.	Africa.	North America.	South America.	Oceania.	Total.
Alluvial Regions	22	54	50	26	45	31	43
Regions in which denudation and sedimentation are equal)	8	3	3	4	9	..	4
Denudation preponderating .	9	7	14	27	1	2	11
Sedimentation preponderating .	54	33	33	38	35	62	38
Eolian deposits eroded; Loess	7	3	..	5	10	..	4
Coral islands . . . . .	..	..	..	..	..	5	0

2. SUBMARINE DEPOSITS (PERCENTAGE).

—	Pacific Ocean.	Indian Ocean.	Atlantic.	Total.
Continental deposits	12	15	23	22
Organic deposits	29	65	62	42
Inorganic deposits (red clay) .	55	18	13	33
Coral sand	4	2	2	3

It appears from Dr. von Tillo's calculations that one-quarter of the land-

surface of the globe is covered by laterite, which is the type of soil most common in the tropics. It occupies 49 and 43 per cent. respectively of the area of Africa and South America, these continents having a greater extent in tropical regions than any other. Clay, though only forming 18 per cent. of the total land-surface, claims 37 per cent. of Asia (Siberia, Central China). As regards the submarine deposits, the Atlantic Ocean has the largest percentage of continental deposits—a fact which strikingly illustrates the extent of the Atlantic drainage area. The Atlantic and the Indian Oceans show a preponderance of organic deposits, while the bottom of the Pacific is covered to an extent of over half its surface by red clay. A comparison of the northern and southern hemispheres reveals a curious equality in the distribution of the various types. Preponderating sedimentation occupies 38 per cent., or 4 per cent. of the area of each hemisphere. We find denudation and sedimentation equal; loess, too, is about equally divided. It appears, however, that the area of alluvial formation is more extended in the Southern Hemisphere; while active denudation affects 14 per cent. of the Northern against only 2 per cent. of the Southern Hemisphere.

Movements of Underground Water.—In Bulletin No. 5 of the Weather Bureau, recently issued by the U.S. Department of Agriculture, Professor F. H. King discusses an interesting series of experiments on fluctuations in the level and the rate of movement of ground water, made at the experimental agricultural station at Whitewater, Wisconsin. The observations deal with fifty-six wells sunk in glacial clay near the margin of Lake Mendota, covering an area some 1200 feet by 1000 feet, at twelve of which the variations of level were continuously recorded by automatic instruments. Starting with a confirmation of the general rule, due to Mr. Baldwin Latham, that the flow of subterranean water conforms to the surface of the country, the observations disclose periodic variations of level of great complexity. It is shown that there is a marked tendency to semidiurnal oscillations, the water as a rule standing higher in the morning, or at least falling less rapidly during the night. Experiments show that these oscillations are caused by changes in the retentive power of the soil, produced at least in part by variations of temperature, although it has not been possible to prove the absence of the tidal effect suggested by Roberts in 1883, a point which receives fresh interest from the recent researches of Rebeur-Paschwitz at Teneriffe. The change of level produced by the passing of a heavy train in a well 140 feet distant from the railway track raises another similar question, which indicates the possibility of obtaining important results from a comparison of simultaneous records from a seismograph and the well instruments. Professor King finds a remarkably close agreement between the changes of rate of flow from drains and springs and those of barometric pressure.

Magnetical Survey and Gravity-Measurements.—The measurements of magnetic declination, inclination, and total intensity throughout Austria-Hungary, which must be completed next year, are being continued, and the magnetic survey of Bosnia and Herzegovina is about to be commenced. The same measurements will be continued by naval officers along the whole coast-line of Dalmatia, Albania, and Greece. At the same time measurements of the force of gravity at different heights will be carried out, and the variations due to the attraction of various strata of the Earth's crust studied. These measurements were undertaken in Austria by Lieut. R. von Sterneek, in 1882, and have already given most brilliant results; this year they will be continued in distant seas by an officer of the navy, Lieut. Gratzel, who has accompanied the Grand Duke Franz Ferdinand Este on his journey around the world, and now takes on board his ship a pendulum-apparatus for making pendulum observations at various spots of the Pacific Ocean.

The 'Pola' Deep-Sea Explorations.—The full results of the deep-sea explorations which were made during the last three summers in the Eastern Mediterranean basin on board the *Pola* have just been issued as a separate work. The Vienna Academy of Sciences has decided to continue the same explorations in the Aegean and the Marmora Seas this summer. The configuration of the sea-bed, the temperature, the density and salinity of water at great and small depths, as well as the colour of water, its transparency, and its permeability for chemical rays, will be studied, as well as the organic life at various depths. The *Pola*, which is supplied with the very best instruments, and is well equipped for its special purpose, will be under the command of Captain W. Moerth. Hofrath F. Steindachner, Director of the Zoological Department of the Natural History Museum, will have the general management of scientific work; while J. Luksch, Professor of the Marine Academy, undertakes to make the physical observations; Dr. K. Natterer will carry on the chemical work; and Dr. E. von Marenzeller, who has just communicated to the Academy an elaborate 'Report upon New Deep-sea Echinoderms,' will make the biological explorations. The soundings will be carried on by naval officers.

EDUCATIONAL

German School Tours.—In 'Child Life' for November last there is a description of one of the school tours which play an important part in the system of education in vogue in German schools, and primarily assist the study of geography, though at the same time helping history and other branches of study. The scheme of instruction followed by the school in question is arranged according to the principles of Herbart, as methodised by his follower Ziller. According to the German method of *Heimatskunde* the third school year (*i.e.*, for children of nine or ten

years of age) is devoted to the study of the immediate neighbourhood of the place in which they live. Instruction is first given at school as to the physical features, animals, and plants, legends, etc., of the district, and this is then impressed upon the minds of the pupils in an expedition intended to bring everything actually before their eyes. In order that the full benefit may be gained from it, the children are accustomed beforehand to receive instruction in the open air, and including recreation, to spend the greater part of the day out of doors. They set out with knapsacks on their backs, prepared for an absence from home of two nights, led by their teacher, who explains and questions on all that is seen. They pass through the towns they have heard of, and visit the cathedral or whatever else may be worth seeing, usually for the sake of health and economy, spending the night at some little country inn. They live very simply, and the tour costs surprisingly little. Each succeeding year a more extended one is made, and boys of sufficient means may even go as far as Venice and the Tyrol, still with knapsacks on their backs. This method of instruction is dealt with by Professor Rein and others in handbooks published at Dresden (Bleyl and Kammerer).

GENERAL.

The Work of the Russian Geographical Society.—The annual meeting of this Society was held on February 1st, 1893. A report on the work of the Society was read by the Secretary. It deplored the loss of the last survivor of the founders of the Society, P. A. Tchihatcheff. The new expeditions of the Society were then referred to, the report dwelling at some length upon those to Central Asia. One of them is already at work, M. Berezowski being in the province of Se-chuan; while the members of the other—M. Potanin and the geologist Obrucheff—have started from Peking. The report then goes on to mention that during the past year explorers were at work in Central Russia, collecting materials relative to the extremely original musical construction of Russian popular songs. They will now continue these in the governments of Yaroslav, Viatka, and Kostroma. M. Vilkitzky made, last year, determinations of the force of gravity and the magnetic elements in south-west Russia. The reserve capital of the Society amounts to 122,100 roubles. The Constantine medal was awarded this year to M. Karpinsky for his geological work; the Count Lütke medal was awarded to Professor Klossovsky for his extensive meteorological researches relative to the climatic conditions of south-west Russia; and two great gold medals were awarded, one to A. I. Sobolevsky for ethnographical work, and the other to N. Borodin for his book on the Ural Cossacks. Four small gold, and several silver, medals were distributed for works of less importance.

Hinná : An Ancient Remedy for Scurvy.—Major Raverty sends the following interesting note on this subject: "In my researches into the geography and history of Central Asian countries I met, some time ago, with accounts of the havoc worked by scurvy among the defenders of some of the strong fortresses of Ghur and Gharjizstán, east and north-east of Hirat, and other parts, and the accidental discovery of a remedy for it. After reading Dr. Nansen's interesting paper in the January number of the *Geographical Journal*, it occurred to me that it might be of interest (and possibly of use) to him and to other explorers to hear of a remedy used with great efficacy just six hundred and sixty-six years ago. The most notable case was during the siege of the fortified town of Uk, of Sijis-stán, by the Mughals in 1227 A.D., which held out for nineteen months. The people of the place were afflicted with the pestilence, the presence of which was indicated by their mouths aching and swelling; then their teeth became loose, and the third day after being attacked death would ensue. It so happened that one day a woman in the place was attacked with this aching of the mouth, and next day all her teeth became loose. She had a little daughter, and, giving up all hope of life, on the third night (the night precedes the day in the East) she said to her child: 'My dear, to-night I will anoint thy hands and feet with *hinná*, for to-morrow is the third day, and the time of thy mother's decease is near.' Now it is usual with women, when applying *hinná* to the hands and feet of anyone, first to moisten their fingers with their saliva, and then they apply the *hinná* to the part to be dyed. Having applied the *hinná* to the child's hands and feet, the author who relates these facts says, 'The woman then resigned her heart to death, and went to sleep.' In the morning she awoke, and found that her teeth during the night 'had become firmly fixed at the roots, and the aching of the mouth had entirely passed away.' When the third day came and passed, the neighbours came in expectation of finding her dead; instead of which they found her recovered, and on the fourth day she had become quite well again. The author says the people were astonished, and after hearing the woman's account, agreed together that *hinná* was the cure for this disease; and afterwards, whenever people were attacked by it, they used to put a bit of *hinná* in their mouths, and they used to recover. After that a *mann* (from two pounds to six pounds, according to locality) of *hinná* reached the price of two hundred and fifty gold *dinárs* (sequins—about £145), and it was afterwards extensively used."

Dallmeyer's Telephotographic Lens.—This lens, to the production of which Mr. Dallmeyer first turned his attention in the autumn of 1891, is likely to prove of great value to explorers. The object in view was to construct a lens capable of producing large primary images of sufficient brilliancy to be of practical value in rapid photography.

Hitherto, in the production of large images, it has been accomplished by the use of very long focus positive lenses, or by the production of a primary image by one positive lens, and placing a secondary magnifier, or second positive lens, behind the plane of the primary image, to enlarge it according to its focal length. The first of these methods is principally employed in astronomy, and would be quite unsuitable for an explorer; while the second method referred to is practically useless for ordinary photographic work, on account of the great loss of light involved. The telephotographic lens is composed of two elements, and the image given by it is primary and inverted. In principle it is identical with Dollond's adaptation of Barlow's lens for increasing the focal length, and, accordingly, the magnitude of the image, without materially lengthening telescope tubes; but there are differences in detail. The results obtained by the use of this lens, judging from the specimens which have been exhibited, are highly satisfactory. Its magnifying power is so great that it gives minute details, in objects photographed, which are quite invisible when taken from the same spot with an ordinary camera. As might be supposed, it is not so rapid as the ordinary lens employed in photography; but with favourable atmospheric circumstances it is sufficiently rapid for all practical purposes. To maintain the necessary rapidity, and amount of angle included, the form of construction recommended gives a magnification of four times linear, as compared to an ordinary lens requiring the same extension of camera. The form of construction of the lens, however, is such that an image can be formed at any extension of the camera. The less the extension the less the magnification, but the greater rapidity, and *vice versâ*. The positive element of the telephotographic lens consists of the well-known portrait lens of the late J. H. Dallmeyer; and the complete lens only requires a special negative attachment that can be adapted to either old or new lenses of that type. A pamphlet has been published by the inventor giving full particulars of the manner in which this lens can be used to the best advantage.

CORRESPONDENCE.

The Nomenclature of the Karakoram Peaks.

March 16th, 1893.

SIR,—I have been unable to reply to Mr. Conway's communication in the February number on "The Nomenclature of Himalayan Peaks" owing to other work. I still consider there is no evidence worthy of acceptance to connect either Chiring or Skinmang with any peak in their vicinity. I am well aware it is frequently the case that the name of the higher pastures, or a stream flowing through them, will give the name to some culminating point rising at their head. Such names are generally well-known to the shepherds or the native *shikaris* who hunt there,

but I cannot remember an instance where such names lying in one line of drainage have been applied to peaks at the head of another main valley many miles away.

All the halting-places on the "Punmah" or "Pulmah Glacier" are well-known to those Baltis who, being connected in trade with Yarkand, cross the main range here. No place is better known than Skinmang, and I cannot conceive, firstly, by what line of reasoning that name can be applied to a peak somewhere east of Captain Younghusband's Mustakh Pass, which must be somewhere at the head of a tributary glacier joining the great glacier he came up on the north; and, secondly, how Chiring can be transferred to K2, which is 20 miles away and not visible from that halting-place. If we knew another Chiring was situated on the Baltoro Glacier, or on the road to Yarkand on the north side of the Mustakh, I can well imagine its being applied to K2. When, however, the Baltis transfer the name of a pasture to a peak they add the affix "go," the Thibetan for the *head*; and Skinmang would become Skinmango; Chiring, Chiringo. Look at the engraved sheets of the country near Skardo for numerous instances of this nomenclature, and I have found the same to extend far east of Ladak to the neighbourhood of the Pangkong Lake. If Skinmang could be applied to the name of any peak it would naturally be to one I ascended from the place itself; from there I saw all the peaks on the high ridge to the south separating us from the Baltoro Glacier. Not a native with me, and they knew the ground well, and were the best guides that could then be procured, called any of them after Skinmang, even the one I was on had the name of Mide Go.

From the time I first saw K2, from the peaks on the border of the Deosai plains, and when working towards it in 1861 (and no personality was attached to it in those days), although constantly asking men of the country, I never succeeded in obtaining a name for it, or I should have at once put it down and verified it. My great object was to obtain names for the numerous peaks, only then known to the Survey by the letter K series (Karakoram) of observed angles, or the T. I. series (Trans-Indus), or B, those observed by Mr. G. W. Beverley. This assistant and Messrs. W. H. Johnson and G. Shelverton, who took part in the triangulation, would have recorded the name of any well-marked peak in preference to a letter on getting reliable information. Mr. R. Lydekker, when on the Baltoro and on the Punmah Glacier, informs me he constantly tried to get a name for K2, but without success. Mr. F. Drew had peculiarly good opportunities of getting a name if any existed, during the time he was in Baltistan. He had lived for years in Kashmir in the Maharaja's service, and spoke well, not only Hindustani, but Kashmiri and Panjabi. Can all this be overlooked, and on the meagre, unsupported evidence of one native this name "Chiring" be put forward as one worthy of acceptance? It was hardly worthy of serious record. A native will say anything, particularly when leading questions are put to him, and he thinks he will please his questioner, and be rewarded for his information; besides, this man's statements were not even supported by any evidence, ocular or otherwise. This, in my opinion, is a somewhat hasty, slipshod, unreliable method of obtaining and perpetuating geographical information, and with what object on such single testimony. I quite think a local name should be adopted in all cases, if one can be found in use among the natives, and there are many good instances in Baltistan, such as Masherbrum, etc., but it is utterly wrong to strain evidence, unsupported, to fit one in, nor can an appeal to rules or the writings of others assist in strengthening unreliable evidence.

I am sorry Mr. Conway has said my interest in the name of K2 is a personal one, as if my object in noticing the Geographical "Notes" in the December number was actuated by such a feeling; it is rather cutting the ground from under my feet, and certainly does not make anything I may write a pleasurable task. I should

myself have preferred, long ago, to see the peak called "Mount Waugh," after the Surveyor-General of India, during whose tenure of office it was first observed to, and following the precedent of naming the highest point of the Himalayas "Mount Everest" some years before. I am at the same time not in favour of surnames of persons being given to unnamed peaks, still less am I in favour of such English compounds as "The Watch Tower of India," "The White Lily," "The Pioneer Peak," which Mr. Conway delights in, because eventually according to the taste of the traveller we shall be presented with all sorts of fanciful, incongruous or vulgar titles, perhaps to the exclusion of the native names.

I am led also to write again on this subject, as I notice in *The Leisure Hour* for February Mr. Edward Whymper including "Chiring" among the names of K2, together with that of "Dapsang Peak" (the Schlagintweits having called it thus from the point they saw it from). Now these Dipsang plains (see Indian Survey Sheets) are no less than 95 miles from K2, and can hardly, by any stretch of imagination, be called a neighbouring plateau. Moreover, from that plateau, the summit of K2 can only be seen rising 50 miles beyond the high intervening range some 20,000 feet at the head of the Nubra River. I cannot agree with Mr. Whymper that this is an appropriate name, for if any high plateau is to give its name to K2, surely "The Deosai Peak" is the one we should select, for it is so much nearer, only 40 miles, and facing the peak itself, affording the most splendid view of it and the whole range of peaks in its vicinity. But why go in search of names when "The Mustakh Peak" would be the best and most accurate title of all?

The peak for which I obtained the name Mango Guzor is not named I consider after the pasture on the Biafo glacier, but from pastures under the peak itself, for being the highest they are called by those who use them "Mang Go." This term appears to be as common and similar in its indication as our farm names for fields, "Further-moor," "further-meadow," "further-worth," &c. The meaning of Guzor I do not know for certain, but it is not unlikely to be the name of the individual or family who went up under the peak in the summer months with the sheep, goats and half-bred yaks. The people of Baltistan, from long intercourse with the Dogra troops quartered in their country (and many of them serve in the Maharaja's army at Srinagar and Jammoo), have picked up a great number of Kashmiri and Panjabi words, in common use in the outer hills. I think it very possible that "Guzor" is only a corruption of "Gujur," the name of the class who in that part of the outer Himalayas wander about the high pastures in the summer months with their milch buffaloes and cows. Thus Mango Guzor would mean "the high or head pasture of the 'Gujurs'" by the people of Shigar who use it, and simply Mango by those of Askolay who do not go there.

H. H. GODWIN-AUSTEN, Lt.-Col.

The Editor of *The Geographical Journal*.

[Whether there is or is not a local name for K2 is a question that has long been discussed. A native told Mr. Eckenstein that there was one, and that it was Chiring. Mr. Eckenstein reported the statement to me, and I, as in duty bound, put the statement on record for what it was worth, pronouncing, however, no opinion upon it. In the *Journal* for February Colonel Godwin-Austen rallied me upon "placing reliance and importance on what a native drew on the sand," and implied that I was ignorant of what the names meant. He stated that they were not possible names for peaks. In reply I pointed out that they were possible names for peaks; and moreover, that there were other peaks having similar names. Now Colonel Godwin-Austen withdraws from his position, and, in doing so, writes a letter full of much

valuable information, for which I am more than thankful. He still thinks that Chiring is not the name of K2, and, truth to tell, I have always thought so too, but neither he nor I can be sure. The statement had to be recorded in order to guide the inquiries of future travellers.

I referred to Colonel Godwin-Austen's personal interest in the name of K2, not for the purpose of embarrassing him, but to clear myself from any possible blame in the matter of this already too prolonged correspondence. I desire to do all honour to my forerunners in the exploration of the Mustagh Range, and so desiring, it is with extreme regret that I find myself entangled in argument with one of them over a matter of this sort into which some people (though of course neither Col. Godwin-Austen nor myself) might consider that a personal element entered.

Colonel Godwin-Austen objects to the "Watch-Tower," "the White Lily," "the Pioneer Peak" (I have plenty more in store) as "fanciful, incongruous, or vulgar titles." What does he say to the following:—Giant's Tooth, Maiden, Monk, Peak of Terror, Peak of Storms, Far-water Peak, Pitchfork, Silver Pack-saddle, Lion Peak, Cathedral, Accursed Mountains, Peak of Calamity, Eagle's Rest, Horse's Tooth, Naughty Little Woman, Great Bellringer, Peak of the Three Princes, Great Venetian, Great Paradise Peak, Tower of St. Peter, Rose-garden Mountains, Crystal Mountain, Great Mules, English Ladies, Abraham's Garden, Pulpit, Three Cobblers, Emperor's Range? These are the literal translations of a few local names of mountains in the Alps, taken from the index to Mr. Bell's Alpine Guide.—W. M. CONWAY.]

The Ruins in Mashonaland.

3, WELLS VILLAS, BOWES PARK, LONDON, N.

March 9th, 1893.

DEAR SIR,—In Mr. Swan's letter, dated February 11th, 1893, appearing in last month's *Geographical Journal* (pp. 275 and 276), a number of the statements are inconsistent with what he himself stated previously in Mr. Bent's book ('The Ruined Cities of Mashonaland,' 1892), and in the *Proceedings* of the Royal Geographical Society, 1892.

1. Mr. Swan says ('The Ruined Cities, etc.,' p. 135): "Then its amplitude [namely, that of the sun rising at the summer solstice] will be more nearly 24° , and a line produced in this direction from the altar [in the Great Temple] will pass across the doorway of the sacred enclosure."

But in his above-mentioned letter we find this passage (l. c. p. 275): "I do not base my statement regarding the bearing of the rising sun at the summer solstice on the existence of the altar in the Great Temple—which I have described in the text as merely supposititious; but on the position of the centre of the arc $\Lambda \kappa$."

2. Mr. Swan further states ('The Ruined Cities, etc.,' p. 134): "The centres of the arcs seem generally to have been important points, and altars were sometimes erected at them from which the culminations or meridian transits of stars could be observed." Various passages show that the "altar in the Great Temple" is one of these altars. (See 'The Ruined Cities, etc.,' pp. 143, 144, 145; and *Proceedings* R.G.S., 1892, p. 308).

Yet the letter says (l. c. p. 275): "I do not base my statement of the observation of meridian transits of stars on the existence of the altar in the Great Temple—which I have described in the text as merely supposititious; but on the position of the centre of the arc $\Lambda \kappa$."

3. Mr. Swan explains (*Proceedings* R.G.S., 1892, p. 307): "On the walls of

their temples they constructed ornamental courses of masonry of a pattern symbolical of fertility, to receive directly the sun's rays when it was rising or setting at the summer and winter solstices, thus marking the two great events of the solar year." . . . "Along the wall over the chevron pattern were erected long slabs of stone or monoliths, and one of these probably marked the middle of the pattern, and the others may have marked sub-divisions of the year."

These statements clearly refer to mathematical considerations, viz., to the divisions and sub-divisions of the solar year. Nevertheless, Mr. Swan remarks in his letter (l. c. p. 276): "*I do not think that the position of the patterns on the outside of the temples was fixed on mathematical considerations, although the ends of the chevron pattern on the Great Temple happen to coincide with the points where the arcs change their radii; but I think that the purpose of this pattern was simply to decorate the part of the wall which faced the sun when rising at midsummer.*"

Moreover,

4. Mr. Swan says in his letter (l. c. p. 275) that I do not suggest any other solution. I published last year a full account of my own investigations in connection with this matter in *Petermann's Mitteilungen* (see *Geographical Journal*, Vol. I, p. 183).

5. I should be glad if Mr. Swan would publish the notes or measurements upon which his plans are based. Knowing that his original plan of the great Zimbabwe Temple was made on the scale of 20 feet to 1 inch, and seeing, on the other hand, that he measures off the distances to a limit of accuracy of the fifth part of a foot (see 'The Ruined Cities, etc.' p. 134)—which corresponds to one hundredth of an inch on his original plan, we must know the degree of accuracy of his original measurements made at Zimbabwe before we can judge of the value of his conclusions.

6. As regards my criticism of Mr. Bent's historico-geographical remarks, I have clearly enumerated the instances in which it seems to me Mr. Bent has erred, and a glance at the 'Periplus' and the 17th chapter of the first book of Ptolemy's 'Geography' will prove that what I have said is correct to the very letter.

Yours faithfully,

HENRY SCHLICHTER.

The Editor of *The Geographical Journal*.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1892-93.

Special Meeting, February 20th, 1893.—General R. STRACHEY, R.E.,
C.S.I., Vice-President, &c., in the Chair.

The Paper read was:—

"An Expedition across Tibet." By Captain H. Bower.

There was an exhibition of photographs and birds in the tea-room.

Eighth Ordinary Meeting, February 27th, 1893.—The Right Hon. Sir
MOUNTSTUART E. GRANT DUFF, G.C.S.I., President, in the Chair.

ELECTIONS.—Harold William Ansell; Hon. Henry Campbell Bruce; John
Outliffe; Alexander Jones David; Rev. Walter Hancock; Miss Julia Lindley;

James Perkins; Major Henry Shuckburgh; Captain T. W. Stilwell (5th North-umberland Fusiliers); John Charles Marshall Taylor; Charles S. Cornish Watkins.

The Paper read was:—

"Journeys in Mongolia and Tibet." By W. Woodville Rockhill.

There was an exhibition of photographs in the tea-room.

Ninth Ordinary Meeting, March 13th, 1893.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., President, in the Chair.

ELECTIONS.—*Claude Beddington; Herbert Melville Beddington; William John Philip Benson; Alexander Douglas Campbell; Richard John Cunninghame; Rev. Richard Percival Durnford; Miss E. Grey; Geoffrey Hastings; Colonel Edward T. H. Hutton; Captain Edward A. W. Lendy, D.S.O.; Captain F. D. Lugard; Mary Louisa O'Donoghue; Henry Owen; Hon. Sir Robert J. Pimsent, D.C.L., &c.; Robert Richardson; Captain F. M'Iver Roome; Henry B. Sloc; William Cecil Slingsby.*

The Paper read was:—

"The Chatham Islands: Their Relation to a Former Southern Continent." By H. O. Forbes.

There was an exhibition of photographs, maps, and views, in the tea-room.

Erratum.—In the list of elections on February 13th the name of Mr. Charles H. J. Acret was misspelled Acreb.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

EUROPE.

Germany—Rhine. *Ann. Geog.* 2 (1893): 212-238. Auerbach.

Etude sur le régime at la navigation du Rhin. Par B. Auerbach.

Founded mainly on the Baden Government report, "Der Rheinstrom und seine Nebenflüsse."

Germany—Schleswig-Holstein. Gloy.

Beitrage zur Siedelungskunde Nordalbingiens. Von Dr. Arthur Gloy in Kiel. Stuttgart, Engelhorn, 1892: 8vo, pp. [38].

One of Kirchhoff's series of "Forschungen zur deutschen Landes- und Volkskunde." This paper presents the facts of distribution of population in a remarkably clear and novel manner. It will be specially referred to.

Germany—White Elster. *Mitt. Verein Erdkunde Leipzig* (1891): 1-67. Gruner.

Beiträge zur Hydrologie der weissen Elster von Hans Gruner.

Hungary. *Bul. Soc. Hongroise Geog.* 20 (1892): ap. 25-43. Hanusz.

Ungarn ein Goldland. Von Stephan Hanusz.

The Hungarian original occupies pp. 97-106 of the same volume.

Hungary—Huzuls. *Ausland* 66 (1893): 17-21. Kaindl.

Die Huzulen. Eine Ethnographische Skizze. Von Raimund Friedrich Kaindl (Czernowitz).

Hungary—Lake Balaton. *Bul. Soc. Hongroise Geog.* 20 (1892): ap. 62-67. **Herman.**
Die Fischertopographie des Balaton (Plattensee) mit Rücksicht auf die
Einteilung der Wasserfläche und Kenntnis des Seegrundes. Von Otto
Herman.

The Hungarian original paper occupies pp. 218-223 of the same volume.

Iceland. *Geog. Tidsskrift (Copenhagen)* 12 (1893): 36-45. **Thoróddsen.**
Om Islands geografiske og geologiske Undersøgelse. Af Th. Thoróddsen,
Adjunkt i Reykjavik.

A general account of the physical geography of Iceland.

Italy—Genoa.

Notizie sulle Condizioni Industriali della provincia di Genova, con una
carta stradale e industriale. Pubblicate dalla Direzione generale della
Statistica. Roma, Bertero, 1892: 8vo, pp. 198. *Presented by Miss Cust.*

A report presented to the Italian Geographical Congress by the Statistical Department of the Italian Government.

Montenegro.

Dragovna

Pokushai za Bibliographiju o Tsrnoi Gori sastatvno Marko Dragovna.
Cettinje, 1892: 8vo, pp. 64. *Presented by W. H. Cozens Hardy, Esq.*

A bibliography of Montenegro containing 460 entries.

Pyrenees.

Margerie and Schrader.

Aperçu de la Structure Géologique des Pyrénées. Par Emm. de Margerie
et Fr. Schrader. Paris, Chamerot et Renouard, 1892: 8vo, pp. 66. *Presented by the Authors.*

A complete geological study of the range, with numerous diagrams and a fine geological map on the scale of 1:800,000. The paper is reprinted from the *Annuaire* of the French Alpine Club for 1891.

Russia.

Boddy.

With Russian Pilgrims. Being an account of a sojourn in the White Sea Monastery, and a journey by the old Trade Route from the Arctic Sea to Moscow. By Alexander A. Boddy, Vicar of All Saints, Monkwearmouth, &c., &c. Also an appendix, giving a full history of the Solovetsk Obitel, by the Venerable Archimandrite Meletii. London, Wells, Gardner, Darton & Co. Undated [1892?]. *With maps and illustrations. Price 7s. 6d. Presented by the Publishers.*

Mr. Boddy visited the monastery of Solovetsk, travelling by sea round the North Cape, and returned up the Dwina and Sachona to Vologda, and thence across to Moscow, following the old route of the Muscovy traders. The journey was planned mainly to gather information as to the Russian Church; but the book is throughout thoroughly readable, and the descriptions of places and people are interesting.

Spain.

Chapman and Buck.

Wild Spain (España Agreste) Records of Sport with Rifle, Rod, and Gun, Natural History and Exploration. By Abel Chapman, F.Z.S., and Walter J. Buck, C.M.Z.S., of Jerez. London, Gurney and Jackson, 1893: 8vo, pp. xx. and 472. *Price 21s. Presented by the Publishers.*

An admirably written record of sport and travel, illustrated by a series of excellent sketches and photographs by the authors. While every chapter is as good of its kind as it could well be made, the most interesting geographically are those describing the Betican Wilderness and the journey through the marisma, with its flamingoes and wild camels. It is hard to believe that regions so desert exist in Western Europe; many of the descriptions recall the scenery and fauna of Central Asia. Bull-fighting is the link between the wild Spain of the estancia where the bulls are reared, and the civilised Spain of the cities where they are gracefully slaughtered.

Switzerland—Public Works.

Salis.

La Correction des Torrents en Suisse. Exposé raisonné d'ouvrages exécutés, rédigé par ordre du Département Fédéral de l'Intérieur par A. de Salis. Deuxième Livraison. Berne, 1892: 4to, pp. 34, Plates LII. *Presented by the Département Fédéral de l'Intérieur through Professor Paul Chaz.*

ASIA.

Asia Minor. *Sitzungsab. Akad. Wiss. Wien* 100 (Ab. I.) (1891): 378-399. **Bukowski.**
 Kurzer Vorbericht über die Ergebnisse der in den Jahren 1890 und 1891
 im südwestlichen Kleinasien durchgeführten geologischen Untersuchungen.
 Von Gejza Bukowski.

Another paper by this author on the geology of Balia Maaden in the north-west
 of Asia Minor is published in the same journal, Vol. 101 (Ab. I.), 214-236, with
 diagrams.

"Bassein." *Indian Antiquary* 22 (1893): 18-21. **Temple.**
 The name "Bassein." By Major R. C. Temple.

Bassein in Burma has been known to Europeans as Cosmin up to 1764, then as
 Persain, and since about 1800 as Bassein. Bassein in Bombay has been called by
 Europeans, Baxai, Baqaim, Basain, Bassal, and Bessi, the native name being Wasai.
 Bassein in Berar has for its native name Basim or Wasim.

China—Yunnan. **Pichon.**
 Un Voyage au Yunnan. Par le Dr. Louis Pichon. Paris, Plon Nourrit
 et Cie.: 1893: 8vo, pp. viii. and 286. Map. Price 3 fr. 50 c.

Dr. Pichon travelled from Hanoi up the Red River to the southern part of the
 Yunnan Province.

Dutch East Indies. **Van der Chijs.**
 Nederlandsch-Indisch Plakaatboek, 1602-1811. Door Mr. J. A. Van der
 Chijs. Tiende Deel, 1776-1787. Batavia; 's Hage, M. Nijhoff, 1892:
 8vo, pp. 1073.

India. *Journ. Soc. Arts.* 41 (1893): 329-345. **Hunter.**
 The Progress of India under the Crown. By Sir William Wilson Hunter.

The modern system for the internal defence of India is briefly explained, and the
 advance of commerce described. The paper is followed by a discussion.

India—The Mihran. **Raverty.**
 The Mihran of Sind and its Tributaries: a Geographical and Historical
 Study. By Major H. G. Raverty, Bombay Army (Retired). 8vo. Reprinted
 from *Journal of the Asiatic Society of Bengal* 61 (1892): pp. 155-220.
 Presented by the Author.

Major Raverty has sent to the Society a revised and annotated copy of his paper,
 which will be referred to elsewhere.

India—The Saraswati. *Journ. Roy. Asiat. Soc.* (1893): 49-176. **Oldham.**
 The Saraswati and the Lost River of the Indian Desert. By Surgeon-
 Major C. F. Oldham. With map.

This paper will be noticed elsewhere.

Japan. **Milne and Burton.**
 The Volcanoes of Japan. Part I. Fujisan. By John Milne, F.R.S., and
 W. K. Burton. Collotypes by K. Ogawa. Printed at the Tokyo Tsukiji
 Type Foundry. Not dated [1892]. Price 21s.

Ten large photographs of Fujisan, very finely reproduced, with a few pages of
 descriptive letterpress, make up the first part of what promises to be a work of
 value.

Java—Industries. *Tijd. Indische Taal-Land-Volkenkunde* 36 (1892): 1-112. **Does.**
 Toestand der Nijverheid in de afdeeling Bandjarnegara. Door A. M. K.
 de Does. With illustrations.

Pisidia. **Lanckorenski and others.**
 Les Villes de la Pamphylie et de la Pisidie: Ouvrage publié avec le
 concours de G. Niemann et E. Petersen. Par le Comte Charles Lancko-
 renski. Tome second, avec 3 planches en couleurs, 33 héliogravures et
 154 illustrations de texte. Paris, Firmin-Didot et Cie., 1893. Large 4to,
 pp. (text) 260. Price 100s.

Siberia.**Marsden.**

On Sledge and Horseback to Outcast Siberian Lepers. Illustrated from photographs and drawings. By Kate Marsden. London, Record Press, not dated (1893?): 8vo, pp. xvi. and 244. Price 6s.

A lively account of the hardships of a sledge journey to Irkutsk and Yakutsk along the usual highway and the Lena, followed by a 2000 miles' journey on horseback from Yakutsk to the leper *yurtas* in Sr. dne-Viluisk. The account is quite correct, without any tendency to sensationalism or exaggeration. The description of a forest land on fire, not when the trees but the whole peat soil is burning, is very good and makes a valuable addition to the description of the scenery of Siberia. On reaching the end of this book one feels relieved to learn that the unhappy lepers who were abandoned to themselves in a few *yurtas* amidst the most inaccessible forests, will ultimately be relieved by the erection of a suitable hospital.—[P.K.]

AFRICA.**African Fortifications.***Globus* 63 (1893): 133-142.**Hösel.**

Ueber das Befestigungswesen in Afrika. Von Dr. L. Hösel, Leipzig.

An interesting summary with several illustrations.

British East Africa.*Scot. Geog. Mag.* 9 (1893): 113-126.**Dundas.**

Exploration of the Rivers Tana and Juba. By Commander F. G. Dundas, R.N.

Egypt.**Milner.**

England in Egypt. By Alfred Milner, late Under-Secretary for Finance in Egypt. Second edition. London, Edward Arnold, 1893: 8vo, pp. vii. and 448. Price 16s.

Mr. Milner's record of the work accomplished by the British occupation of Egypt is a standard whereby the actual state of the country during his years of service there may be compared with its past history and its future development.

German East Africa.*Mitt. Deutsch. Schutzgebieten* 6 (1893): 42-60.**Behr.**

Die Wakua-Steppe. Von H. F. v. Behr.

A journey from Lindi for the exploration of the country lying between the Rovuma and the Wakua Steppe.

Kalahari.*Mitt. Deutsch. Schutzgebieten* 6 (1893): 25-39.**Fleck.**

Bericht des Dr. Fleck über seine Reise durch die Kalahari zum Ngami-See. With map.

Madagascar.

The Antananarivo Annual and Madagascar Magazine. No. XVI, Christmas, 1892. Antananarivo: printed at the Press of the London Missionary Society. Presented by the Rev. J. Sibree.

This number contains several short articles of some geographical interest, including one by Rev. R. Baron on a journey of 1200 miles to the north-east and north-west coasts of the island, one by Mr. Thomas Lord on a journey to the south-east of the island, and a series of contributions to the natural history and anthropology of Madagascar.

Madagascar.*Scot. Geog. Mag.* 9 (1893): 127-141.**Savoureux**

Madagascar. By M. Joël le Savoureux.

M. Savoureux resided for several years in the island, and describes it from the French point of view.

Mountain Flora.**Engler**

Ueber die Hochgebirgsflora des tropischen Afrika von A. Engler. Aus den Abhandlungen der königl. Preuss. Akademie der Wissenschaften zu Berlin vom Jahre 1891. Berlin, 1892: 4to, pp. 462. Presented by the Author.

South Africa.

Letters from South Africa. By *The Times* Special Correspondent. Reprinted from *The Times* of July, August, September, and October, 1892. London, Macmillan & Co., 1893: cr. 8vo, pp. 116. Price 2s. 6d. Presented by the Publishers.

These letters convey a good impression of the present condition of South Africa.

Sudan—Travels. *Compte Rendus Geog. Soc. Paris* (1893): 53-82.

Reception du Commandant Monteil.

Report of the special meeting of the Paris Geographical Society in honour of M. Monteil's journey in the Sudan and across the Sahara.

Uganda. *Church Mission. Intelligencer* 44 (1893): 196-204.

Walker.

Notes on Uganda. By the Rev. R. H. Walker.

A useful plan of Mengo, and a sketch-map showing the territorial divisions of Uganda accompanying the paper.

West Africa. Brosselard-Faidherbe.

Capitaine Brosselard-Faidherbe. Casamance et Mellacorée. Pénétration au Soudan. Paris, 4to, pp. 106, maps and illustrations. Price 3 francs.

Zambesi.

Rankin.

The Discovery of the Chinde Entrance to the Zambesi River. By Daniel J. Rankin. Roy. 8vo, pp. [6]. From the 'Fortnightly Review,' December 1892.

NORTH AMERICA.**Alaska.**

Egerton.

Alaska and its Glaciers. By Lady Grey Egerton. Roy. 8vo, pp. [11]. From the 'Nineteenth Century,' December 1892.

America.

Cronau.

Amerika. Die Geschichte seiner Entdeckung von der ältesten bis auf die neueste Zeit. Eine Festschrift zur 400-jährigen Jubelfeier der Entdeckung Amerikas durch Christoph Columbus. Verfasst und illustriert von Rudolf Cronau. Leipzig, Ubel und Müller, 1892: 2 vols., 4to, pp. I 480, II 532. Price 24 marks.

These large and handsome volumes are profusely illustrated with maps and views. They give in moderate compass a sketch of all that is known regarding America from the oldest geological time, through the prehistoric period, and down to the present day.

Historical.

Atkins.

Indian Wars and the Uprising of 1655—Yonkers Depopulated. A paper read before the Yonkers Historical and Library Association. By Hon. T. Astley Atkins, March 18th, 1892. Yonkers, 1892: large 8vo, pp. 14. Presented by G. B. Balch, M.D., Librarian of the Association.

United States—Minnesota.

Winchell.

The Geological and Natural History Survey of Minnesota. The Nineteenth Annual Report for the year 1890. H. N. Winchell, State Geologist. Minneapolis, 1892: 8vo, pp. 256.

The report includes translation of a paper on "Geognostic and Geographic Observations in the State of Minnesota," by Dr. J. H. Kloss, pp. 81-121, and a memoir on "The Woods of Minnesota," by H. B. Ayres, pp. 128-137.

CENTRAL AND SOUTH AMERICA.**Argentina.**

Gastrell.

Argentine Republic. Report for the year 1892 on the General Condition of the Argentine Republic. [By Vice-Consul William S. H. Gastrell.] No. 1147 Diplomatic and Consular Reports on Trade and Finance. Foreign Office, 1893. London: 8vo, pp. 120. Printed for Her Majesty's Stationery Office. Price 6d.

British Guiana.**Im Thurn.**

Notes on British Guiana. By E. F. Im Thurn, M.A., C.M.G. A paper read before the Royal Colonial Institute, December 13th, 1892: 8vo, pp. 32.

An epitome of the present condition of the Colony of British Guiana.

British Honduras.**Knollys.**

British Honduras: Outlines of its Geography. By Reginald J. Knollys. London, National Society's Depository: 12mo, pp. 58. *Presented by the Author.*

Compiled for use in the schools of the colony.

La Plata.*Bull. American Geog. Soc.* 24 (1892): 479-509.**Morong.**

The Rio de La Plata: Its Basin, Geography, and Inhabitants. By Thomas Morong.

A popular lecture delivered to the American Geographical Society giving an account of a voyage up the Rio de la Plata.

Nicaragua.*Pet. Mitt.* 39 (1893): 25-39.**Mierisch.**

Eine Reise nach den Goldgebieten im Osten von Nicaragua. Im Auftrage der nicaraguanischen Regierung ausgeführt im Jahre 1892. Von Dr. Br. Mierisch.

This paper will be specially noticed.

AUSTRALASIA AND PACIFIC ISLANDS.**Australian Handbook.****Gordon and Gotch.**

The Australian Handbook (incorporating New Zealand, Fiji, and New Guinea). Shippers and Importers' Directory and Business Guide for 1893. Twenty-fourth year of issue. London, Gordon & Gotch, 1893: Roy. 8vo, pp. 608. *Numerous maps and plans.*

This work includes the most complete and best-edited gazetteer of Australasia.

Hawaii—Kilauea.*American Journ. Sci.* 45 (1893): 241-246.**Dodge.**

Kilauea in August 1892. By Frank S. Dodge.

Exact measurements of the crater, compared with the survey of 1888.

New South Wales.*Records Geol. Surv. N.S.W.* 3 (1892): 68-70.**Etheridge.**

Report on a visit to the Narrangullen, or Cavan Cave, Taemas, Murrumbidgee River. By R. Etheridge, Junr. *With a plate.*

New Zealand.**Perceval.**

New Zealand. By Westby Brook Perceval. A paper read before the Royal Colonial Institute, May 10th, 1892: 8vo, pp. 40. *Presented by the Agent-General for New Zealand.*

A statement of the prosperity and progressiveness of the colony.

Western Australia.**Calvert.**

Western Australia and its Gold Fields. By Albert F. Calvert. With Government Map. London, G. Philip & Son, 1893: 12mo, pp. 61. *Price 1s. Presented by the Publishers.*

Deals with the geography, resources, climate, &c., of Western Australia.

POLAR REGIONS.**Arctic Exploration.****Keely and Davis.**

In Arctic Seas. The Voyage of the *Kite*, with the Peary Expedition; together with a transcript of the log of the *Kite*. By Robert N. Keely, Jun., M.D., and G. G. Davis, A.M., M.D. Illustrated with maps, portraits, and photographic views. London, Gay & Bird, 1893: sq. 8vo, pp. viii. and 524. *Price 18s.*

The voyages of the *Kite* with Peary to the Greenland Coast in 1891, and to the Greenland Coast for Peary in 1892, are described, with many illustrations.

- Greenland.** *Bull. American Geog. Soc.* 24 (1892): 536-558. **Peary.**
The North Greenland Expedition of 1891-92. An address by Civil Engineer R. E. Peary, U.S.N. With illustrations.

- Greenland.** **Poussin.**
Les Voyages d'Exploration sur l'Inlandsis du Groenland. Par J. de la Vallée Poussin. Bruxelles, 1893: 8vo, pp. 46. Reprinted from the *Revue des questions scientifiques*, January, 1893. Presented by the Author.
Notes on the various attempts to explore the Inland Ice of Greenland.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

- Air and Sea Temperature.** *Pet. Mitt.* 39 (1893): 39-44. **Zenker.**
Die gesetzmässige Verteilung der Lufttemperaturen über dem Meere.
Von Dr. W. Zenker.

- Earth's History.** **Roberts.**
The Earth's History, an Introduction to Modern Geology. By R. D. Roberts, M.A., D.Sc. London, John Murray, 1893: 8vo, pp. xxiv. and 270.
Maps and illustrations. Price 5s. Presented by the Publisher.

In this volume of Murray's University Extension Manuals Dr. Roberts gives an account of the evolution of terrestrial features, and the system of waste and repair that is continually in operation. It is a well-planned epitome, making no attempt to be exhaustive, but laying down all the main lines of scientific thought, along which a student, stimulated by reading these attractive chapters may advance to the more detailed study of geology.

- Islands.** *Natural Science* 2 (1893): 188-191. **Jukes-Browne.**
The origin and Classification of Islands. By A. J. Jukes Browne; with a note by Alfred Russel Wallace, LL.D.

- Magnetic Conditions.** *Sitzungs. Akad. Wiss. Wien* 101 (Ab. IIa.) (1892): 142-157. **Liznar.**

Ueber die Bestimmung der bei den Variationen des Erdmagnetismus auftretenden ablenkenden Kraft, nebst einem Beitrage zur elfjährigen Periode des Erd-magnetismus (vorläufige Mittheilung). Von J. Liznar.
Illustrations.

See also a paper by the same author in Vol. 100 (Ab. IIa.), 1153-1165.

Marine Research, Mediterranean.

Berichte der Commission für Erforschung des Oestlichen Mittelmeeres. Erste Reihe. Vienna. Published by the Kaiserlich Akademie der Wissenschaften. Not dated [1893?] 4to, pp. 112. Numerous maps and illustrations. Presented by the Academy.

Captain W. Mörth gives an account of the Austrian surveying ship *Pola* and her equipment for deep-sea research. Professor J. Luksch describes the physical observations made on the *Pola* during the two cruises of 1890 and 1891, and Dr. K. Natterer discusses the chemical work of the expeditions. The illustrations include special bathymographical charts, and temperature curves and sections.

- Mediterranean.** *Sitzungs. Akad. Wiss. Wien* 100 (Ab. IIa.) (1891): 927-935. **Luksch.**
Veröffentlichungen der Commission für Erforschung des östlichen Mittelmeeres. Vorläufige Bericht über Lothungen und physikalische Beobachtungen im Sommer 1891. Von J. Luksch.

The physical work of the *Pola* expedition. With map of route.

- Ocean Depths.** *Natural Science* 2 (1893): 180-187. **Suess.**
Are Great Ocean Depths Permanent? By Professor Edward Suess, Ph.D.

Professor Suess sums up the recent controversy on this subject in the words, "I see no reason why parts of the ocean, or even of the dry land, may not to-morrow sink to form new depths, or why we should believe that all the great ocean basins have been continuously covered by water since panthalassic times. But all this is unripe fruit. Our scholars will some day know more than their masters do now, so let us patiently continue our work and remain friends."

Ordnance Survey.

Report of the Departmental Committee, appointed by the Board of Agriculture, to inquire into the Present Condition of the Ordnance Survey; with copy of the minute appointing the Committee. London. Printed for H.M. Stationery Office, by Eyre and Spottiswoode, 1893: 4to, pp. xlii. Price 4½d.

Photographic Surveying.

Reed.

Photography applied to Surveying. By Lieut. Henry A. Reed, U.S. Army. Second edition. New York, Wiley & Sons, 1889; 4to, pp. 68. Plates and other illustrations.

Position at Sea. *Sitzungsb. Akad. Wiss. Wien* 101 (*Ab. IIa.*) (1892): 205-213.

Geleich.

Die Bestimmung der geographischen Schiff-position in dem sogenannten kritischen Falle. Von Eugen Gleich. *Illustrations.*

Winds.

Thomson.

On the Grand Currents of Atmospheric Circulation. By J. Thomson, LL.D., F.R.S. (The Bakerian Lecture, 1892). London, Published for the Royal Society, by Kegan Paul, Trench, Trübner & Co, 1891: Roy. 4to, pp. 653-684. Price 1s. 6d. Presented by the Royal Society.

Zones of the Earth. *Bol. Soc. Geog. Italiana* 6 (1893): 40-51.

Minutilli.

La Variazione delle zone terrestri. Nota del socio prof. Federico Minutilli.

Historical notes on the division of the Earth's surface into zones of climate.

GENERAL.**Biography—Bates.**

Allen.

Bates of the Amazons. By Grant Allen. Roy. 8vo, pp. 12. From the 'Fortnightly Review,' for December, 1892.

Biography—Beccari. *Deutsche Rundschau* 15 (1893): 277-279.

Miessler.

Odoardo Beccari. Von Adolf Miessler. With portrait.

Biography—Keleti. *Deutsche Rundschau* 15 (1893): 279-282.

Palocz.

Karl Keleti. Von Prof. L. Palocz. With portrait.

British Colonies.

Hughes and Williams.

The Geography of the British Colonies and Dependencies, Physical, Political, Commercial. By William Hughes and J. Francon Williams. London, G. Philip & Son, 1892: sm. 8vo, pp. viii and 232, map. Price 2s. 6d. Presented by the Publishers.

French Colonies.

Rambaud.

La France coloniale, Histoire—Géographie—Commerce. Par Alfred Rambaud avec la collaboration d'une Société de Géographes et de Voyageurs. Sixième édition. Paris, Armand Colin et Cie., 1893: 8vo, pp. vi. and 792. Maps. Price 8 francs.

A concise and authentic epitome of French colonial history, and of the geographical and commercial conditions of the existing colonies. The various departments of the subject are treated by responsible contributors whose articles are signed, and the work is easy of reference.

General.

Allen.

Science in Arcady. By Grant Allen. London, Lawrence and Bullen, 1892: 8vo, pp. 304. Price, 5s.

Contains several papers on the relations of physical and historical geography in a thoroughly popular form, but showing true appreciations of geographical principles.

German Colonies.

Meinecke.

Koloniales Jahrbuch. Herausgegeben von Gustav Meinecke, Vierter Jahrgang. Das Jahr 1891. Berlin, Carl Heymanns, 1892: large 8vo, pp. 335, maps and illustrations.

Historical Geography.**M'Clymont.**

The Influence of Spanish and Portuguese Discoveries during the first twenty years of the Sixteenth Century on the Theory of an Antipodeal Southern Continent. By James B. M'Clymont, M.A. Extracted from the Report of the Fourth Meeting of the Australasian Association for the Advancement of Science: 1892: 8vo, pp. 24. *Presented by the Author.*

Historical Geography—America.

Hamburgsche Festschrift zur Erinnerung an die Entdeckung Amerika's, herausgegeben vom wissenschaftlichen Ausschluss des Komitès für die Amerika-Feier. Hamburg Friederichsen & Co., 1892: 4to, 2 vols., articles separately paged. *Maps. Price 20 marks.*

The first volume contains papers by Dr. Ruge on the history of Geographical Discovery in the New World, pp. 132; by E. Geleisch on Nautical Instruments and Appliances of the 16th century, pp. 90; by Dr. E. Bansch on the history of the Commercial Relations between Hamburg and America, pp. 256; and by Dr. H. Michow on Caspar Vopell, pp. 22. Vol. II. is occupied by an account by Herm. A. Schumacher of the adventures of the Augsburg merchant Welser and others in Venezuela, and of Juan de Castellanos, pp. 328; and by L. Friedrichsen on Sir Walter Raleigh's map of Guiana, pp. 9. (See *Geog. Journ.* 1, p. 167.)

Travel.**Perkins.**

A Tour Round the Globe. Letters to the *City Press*. By James Perkins, C.C. London, W. H. & L. Collingridge, 1891: 12mo, pp. 76. *Presented by the Author.*

Year Book.**Bonney.**

The Year Book of Science. Edited for 1892 by Professor T. G. Bonney, D.Sc., LL.D., F.R.S. London, Cassell & Co., 1893: 8vo, pp. viii. and 520. *Price 7s. 6d. Presented by the Publishers.*

Of the value of such a year book as this there can be no doubt. It is, however, to be regretted that the section on "Physical Geology and Geography" by Professor Seeley occupies only sixteen pages. Under the head of "recent exploration" St. George Littledale's journey across the Pamirs and Peary's in Greenland alone are mentioned. By a printer's error the former journey is credited to "Sir George" Littledale. Rockhill's journey in Tibet, Conway's in the Karakoram, Diener's in the Central Himalaya, and all the work of African travellers, is passed over. In physical geography proper there are serious omissions. James Geikie's and Lapworth's masterly addresses to the British Association are passed over in silence, the monumental *Challenger* volume on Oceanic Deposits is not referred to under any heading. The Russian work on the Black Sea, the Austrian work on the Mediterranean, the United States Coast Survey work on the Gulf Stream, the Prince of Monaco's chart of Atlantic currents, Petterson's work on the Baltic, and the Scottish Marine Station's work on the Clyde Sea Area, all published long before the end of 1892, are not mentioned. One-third of the whole space is given to glaciers and glacial phenomena; but Drygalski's work on the Greenland glaciers is not noted, nor is the Savoy disaster referred to. The publication of the last parts of Berghaus's great physical atlas also pass unnoticed. All the other departments of geology and most of the other sciences are very well epitomised, so far as the necessarily contracted limits of the work admit.

Year Book.**Keltie.**

The Statesman's Year Book, Statistical and Historical Annual of the States of the World for the year 1893. Edited by J. Scott Keltie. Thirtieth Annual Publication. London, Macmillan & Co., 1893: pp. xxxvi. and 1152, maps. *Price 10s. 6d. Presented by the Publishers.*

The new and special features of this issue are a small but remarkably clear map of the Pamirs, a map, somewhat highly coloured, of Africa south of the equator showing territorial divisions, and a series of ten statistical tables giving a list of the great cities of the world with population, a summary of the wheat crops of the world, the total production of gold and silver, the external trade of Africa, and the trade of the British Empire. The statistics of the countries of the world have been revised and brought down to the latest date possible.

NEW MAPS.

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EUROPE.

Eastern Alps.

Freytag.

Karte des Sonnblick und Umgebung von Gustav Freytag. Scale 1:50,000, or 1·4 inch to a geographical mile. Kartogr. Anst. v. G. Freytag & Berndt, Wien. *Presented by the Publishers.*

England and Wales.

Ordnance Survey.

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(E. Stanford, Agent.)

France.

Delebecque.

Atlas des Lacs Français, par A. Delebecque, Ingénieur des Ponts et Chaussées, Département de la Haute-Savoie. Publié sous les auspices du Ministère des Travaux Publics. *Presented by the Author.*

This is the first part of an important atlas of the French lakes, containing seven maps. The depths are shown in different shades of blue, and by contour lines for every change of five metres, the places where the soundings were taken being indicated by dots. The maps in the present issue are:—Lac Leman, on the scale of 1:50,000; Lac du Bourget, scale, 1:20,000; Lac D'Annecy, scale, 1:20,000; Lac D'Aiguebelette, scale, 1:10,000; Lac de Paladru, scale, 1:10,000; and the two remaining sheets contain maps of Lacs de St. Point, Remoray, Brenets, Malpas, Nantua, Genin, and Sylans, all on the scale of 1:10,000. On each sheet the latitude, longitude, level, and area of the lake is given, together with the date on which the survey was made. It is the intention of the publishers to complete this atlas during the present year, and it will form a valuable addition to our knowledge of the inland hydrography of Europe, a subject which, both in our own and other countries, does not at present receive the attention it deserves.

Italy.

Fritzsche

Carta Politica Speciale del Regno d'Italia, colla indicazione delle Circo-scrizioni Amministrative (Comprese quelle dei singoli Comuni) e delle Nuove Circo-scrizioni dei Mandamenti e dei Collegi Elettorali e colle Tabelle di altre importanti Circo-scrizioni Territoriale. Scale 1:500,000, or 6·8 geographical miles to an inch. Costruita e disegnata da G. E. Fritzsche su dati riveduti da L. Grimaldi Casta della Direzione Generale di Statistica. Dedicata al Commre. Luigi Bodio Direttore Generale della Statistica del Regno. Eseguita e pubblicata dall' Istituto Cartografico Italiano, Roma, 1893. 20 sheets. Price, 16 sheets at L. 3, and 4 at L. 1·50.

As its title would indicate, this map shows all the political divisions of Italy. It is very clearly drawn, is printed in colours, and, quite independent of its primary object, is an extremely useful map for general reference with regard to means of communication, all railways and main roads being laid down. On sheet 3 an index-map is given, showing the area included in each sheet. Notes explaining the conventional signs, the character used in the lettering, and the abbreviations are given on each sheet, together with other notes on such subjects as commerce, politics, &c. Taken as a whole, the map is an excellent specimen of this class of cartography, the colours are well chosen, and the lettering remarkably clear.

AMERICA.

Guatemala.

Sapper.

Karte der Verbreitung der Sprachen in Guatemala um's Jahr, 1892. Von Dr. K. Sapper. Scale 1:2,000,000, or 27 geographical miles to an inch. *Petermann's Geographische Mittheilungen*, Jahrgang 1893. Taf. 1. Gotha, Justus Perthes. Presented by the Publisher.

Nicaragua.

Mierisch.

Die Goldminen-Distrikte in den Flussgebieten Prinzapolca und Cucubala im östlichen Nicaragua. Auf Befehl Sr. Exc. des Präsidenten Dr. Roberto Sacasa, aufgenommen und gezeichnet von Dr. Bruno Mierisch. Scale 1:700,000, or 9·5 geographical miles to an inch. *Petermann's Geographische Mittheilungen*, 1883. Taf. 3. Gotha, Justus Perthes. Presented by the Publisher.

Patagonia.

Siemiradzki.

Original-Karte des Limay-gebietes in Nordwest-Patagonien. Nach eigenen Aufnahmen entworfen und gezeichnet von Dr. Josef v. Siemiradzki, 1891.—Der südliche Teil der Pampa Central. Nach den Aufnahmen von Dr. Josef v. Siemiradzki, 1891. Scale 1:1,000,000, or 13·6 geographical miles to an inch. *Petermann's Geographische Mittheilungen*, Jahrgang 1893. Tafel 5. Gotha, Justus Perthes. Presented by the Publisher.

United States.

Blanchard.

Map of Washington and Oregon, published by Rufus Blanchard, Chicago, 1891. Scale 1:1,480,000, or 20·3 geographical miles to an inch. Presented by the Publisher.

This is a useful map of the States of Washington and Oregon, on which all means of communication are laid down. It is also furnished with an alphabetical index of the names of all the towns. It contains, as insets, a chart of the Ocean Steamship routes of the World; and a facsimile of a map of Pujet Sound, as explored by Juan de Fuca in 1792.

GENERAL.

Ancient World.

Kiepert.

Twelve Maps of the Ancient World, for Schools and Colleges, by Dr. Henry Kiepert. Berlin, Dietrich Reimer (Hoefer and Vohsen). 11th edition, improved, corrected, and enlarged. London, Williams & Norgate. Presented by Messrs. Williams and Norgate.

This atlas has now reached its eleventh edition, and contains the following maps:—Orbis terrarum antiquis notus; Imperia Persarum et Macedonum; Aegyptus-Phoenice

et Palaestina; Asia eiterior; Graecia cum insulis et oris maris Aegaei; Graecia ampliore modulo descripta; Italia; Italiae pars media; Roma urbs; Hispania, Mauretania, et Africa; Gallia, Britannia, Germania; Imperium Romanum. In addition to these, numerous inset maps and plans are given.

German Colonies.

Kiepert and Partsch.

Deutscher Kolonial-Atlas für den amtlichen Gebrauch in den Schutzgebieten. Nach den neuesten Quellen, mit Verwendung von kartographischem und sonstigem, bisher noch nicht veröffentlichtem, Material der Kolonial-Abteilung des Auswärtigen Amtes und der Neu-Guinea-Compagnie, bearbeitet von Richard Kiepert. Begleitender Text von Dr. Joseph Partsch, Professor an der Universität zu Breslau. Mit Quellen- und Konstruktions-Notizen, sowie mit einem vollständigen Namen-Verzeichnis zu jeder Karte. Berlin, 1893. Geographische Verlagshandlung Dietrich Reimer. Inhaber, Hofer & Vohsen. Price 18 Marks. Presented by the Publishers.

The World.

Hauer.

Facsimile, in gores, of the silver globe presented to Gustavus Adolphus in 1632, now in the National Museum, Stockholm. By Johann Hauer, 1620. Presented by Baron A. E. Nordenskiöld.

This map, which has been presented to the Society by Baron Nordenskiöld, is a facsimile reproduction, in gores, of the actual size of the silver globe which was presented to Gustavus Adolphus in 1632, and which is now in the National Museum at Stockholm. Generally speaking the geography is much the same as that shown in the Hondius edition of Mercator, and the early editions of Blaeu, De Wit, and others of about this date. The inscription on the map shows that it was the work of Johann Hauer in 1620. It contains many notes in Latin on the different countries represented, and, as is usual with maps of that period, contains numerous pictures of marine monsters and ships. As a specimen of reproduction from an old globe, it is in every respect satisfactory, and the lettering, though necessarily small, is remarkably clear.

PHOTOGRAPHS.

West Africa.

Halligey.

One Hundred Photographs of Gold Coast, Yoruba Country, etc., by Rev. J. T. F. Halligey. Presented by Rev. J. T. F. Halligey.

This set of photographs was taken by the Rev. J. T. F. Halligey during his travels on the West Coast of Africa and the Yoruba Country. They have been carefully selected, and illustrate the scenery and some of the remarkable features of the country. They are also of value as showing the types of natives, their dwellings and strongholds. Considering the difficulties under which many of these photographs must have been taken, they are remarkably fine specimens.

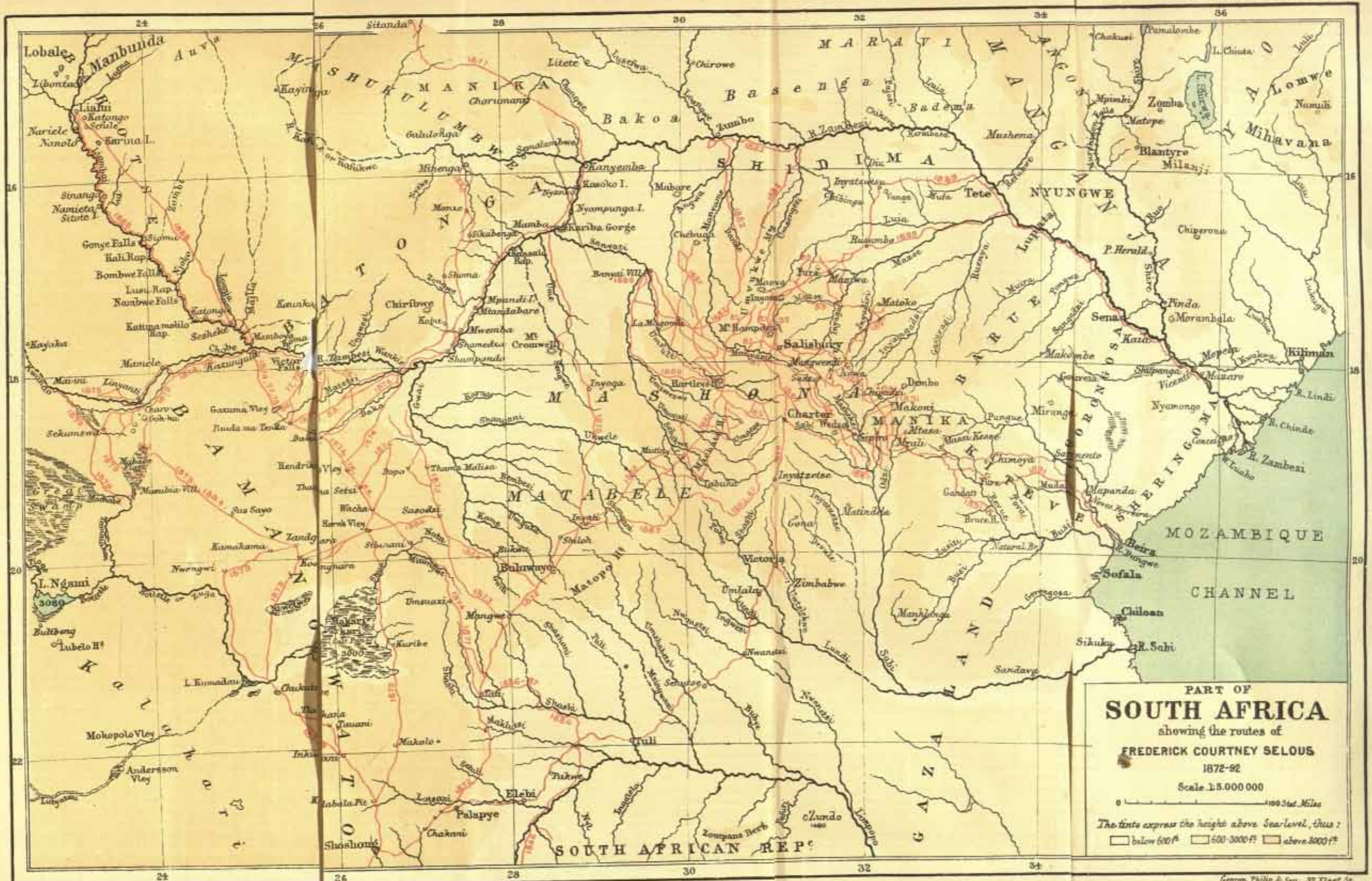
Victoria Falls.

Fry.

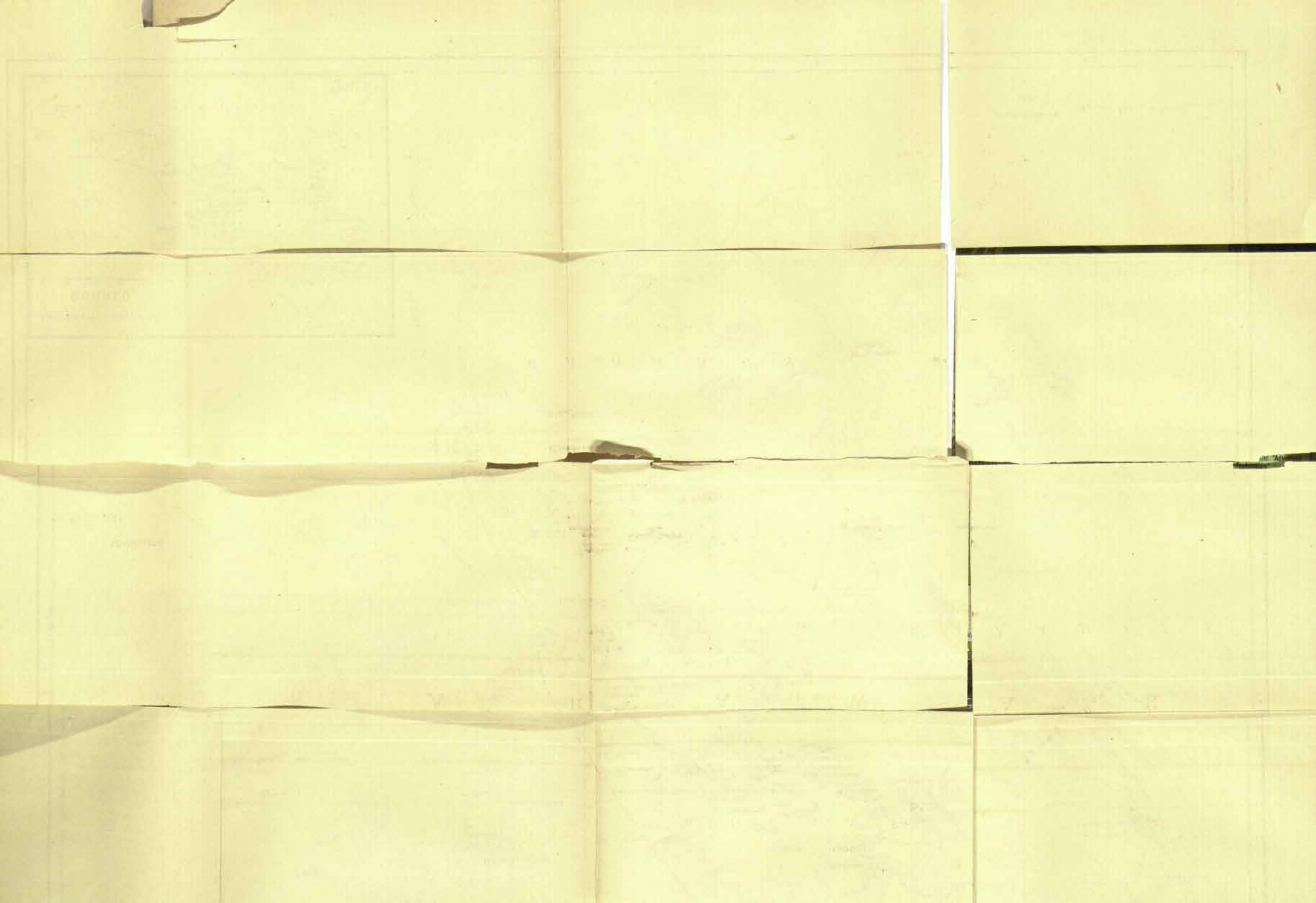
Thirty-seven Photographs of the Victoria Falls and Zambesi River, taken by W. Ellerton Fry, Esq. Presented by W. Ellerton Fry, Esq.

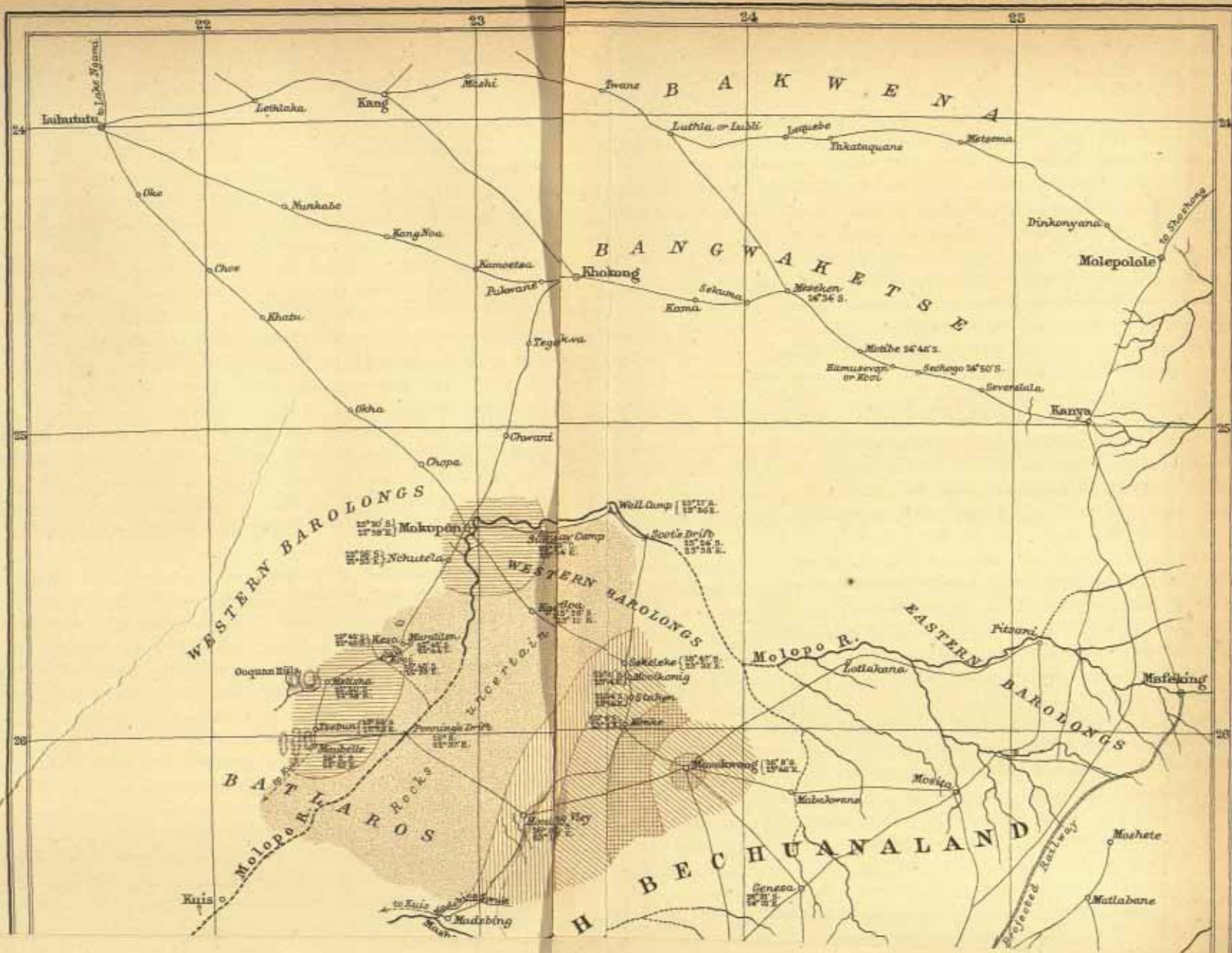
This is an important series of views of the Victoria Falls of the Zambesi, and the river in their vicinity. These photographs are all the more valuable as they are accompanied by a manuscript map indicating the points from which they were taken. They are very good specimens of photography, and give an excellent idea of the remarkable physical features of this locality.

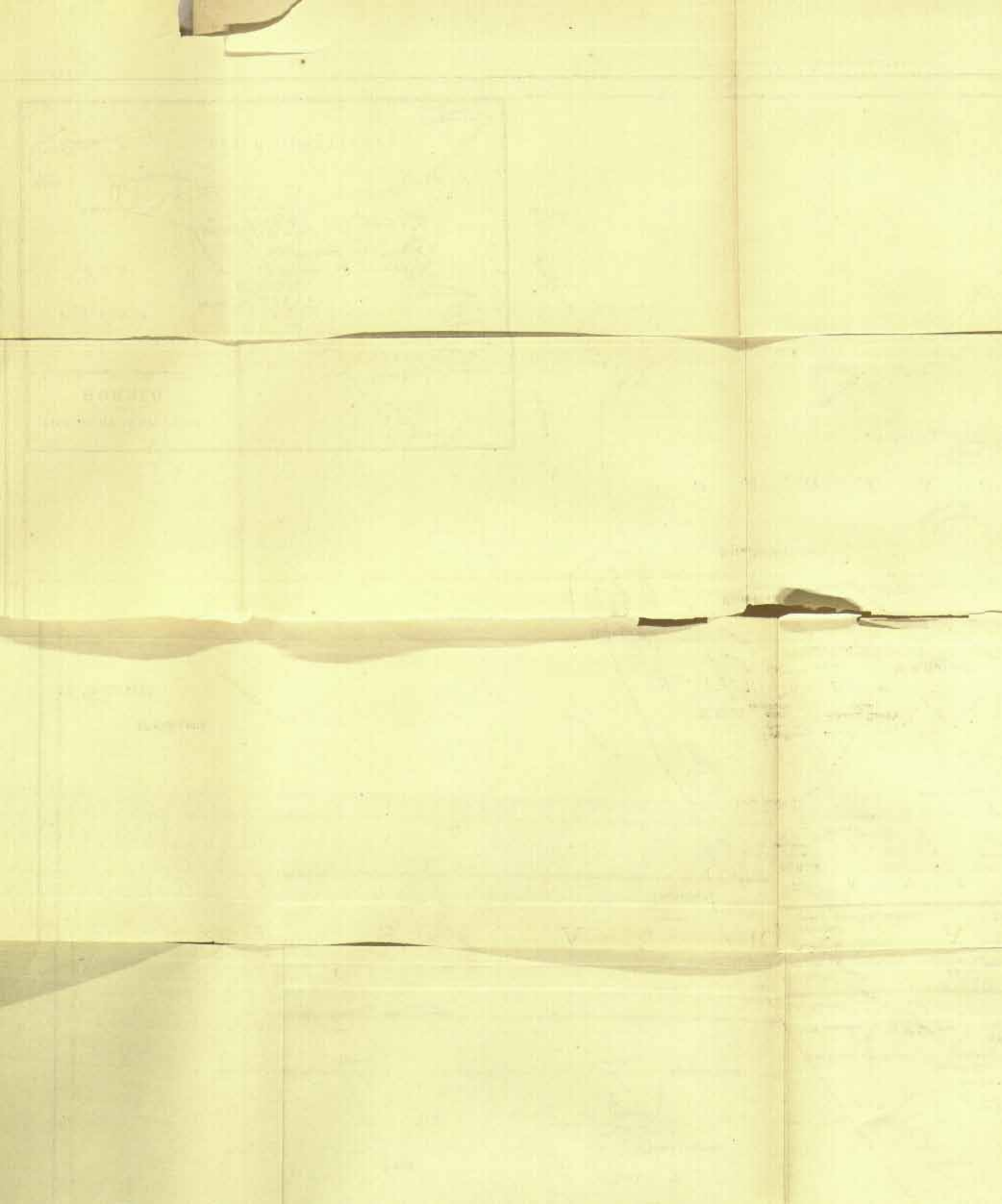
N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



George Philip & Son, 32 Fleet St.







The Geographical Journal.

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VOL. I.

A JOURNEY ACROSS TIBET.*

By Captain H. BOWER, 17th Bengal Cavalry.

IN 1890 I returned from Turkistan, after an absence of fourteen months, thoroughly bitten with that love of travel which comes to all who have once experienced the charm of wandering amidst strange peoples in unknown lands. The biggest blank on our maps of Asia was in Tibet. The southern and eastern parts were partially known through the explorations of various native surveyors; but north of Nain Singh's route, as far as Chinese Turkistan, absolutely nothing was known. A few conjectural lakes were dotted about our maps, but these seemed to have been put in to satisfy the artistic taste of map designers, so if permission could be obtained, I determined to endeavour to cross that unknown stretch of country. Their Excellencies the Viceroy and the Commander-in-Chief gave the scheme their warmest approbation, and Dr. W. G. Thorold, of the Indian Medical Service, having volunteered to accompany me, I left Simla for Kashmir to make arrangements.

On starting for an unknown country it is often a difficult thing to decide as to what transport is the most suitable. Yaks, which are largely used in crossing the high passes of the Himalayas, have the advantage of being almost insensible to cold, and are not much affected by altitude; but the disadvantages are, that they march very slowly, are liable to get footsore, and will not eat grain; therefore they cannot be taken to any place where grass is not obtainable. Sheep are useful, and can carry a load of from 30 to 40 lbs.; but, owing to the winter having been an exceptionally severe one and the spring having been backward, none in sufficiently good condition to start on a long journey were obtainable. I had therefore to content myself with ponies and mules.

My time at Kashmir was very fully taken up in buying animals and clothes, fitting pack-saddles, &c.; but at last, on April 17th, 1891, I

* Read at the meeting of the Royal Geographical Society, February 20th, 1893. Map, p. 480.

was able to set out for Leh, whence the final start was to be made; Dr. Thorold had already gone on. On the road the Zoji La Pass had to be crossed. Though only 11,300 feet high, it was rather difficult to get over, as a great deal of soft snow was lying, and our baggage had to be made into very small parcels and carried by coolies; while the ponies, on which there were no loads, were assisted by men, one being told off for each pony. After crossing the pass we entered Ladakh, and, before long, monasteries, praying wheels, and heaps of stones with sacred inscriptions, brought home to us the fact that we were in a Buddhist country. Leh was reached on June 1st, and we halted there until the 14th, making final preparations for our start into the unknown.

The party marching out of Leh consisted of Dr. Thorold and myself, a native sub-surveyor, my Pathan orderly, a Hindustani cook, a Kashmiri, and six Arghoon caravan drivers. On the road we paid a flying visit to Hemis Monastery, as the annual festival was going on there, and had an opportunity of seeing a Lama masked dance. This was one of the quaintest and weirdest sights I have ever seen. Round and round went these hideously-masked figures in slow measured time, while a hidden choir chanted in true cathedral style.

The Buddhist religion as seen in Tibetan countries has nothing in common with the pure morality preached by Gautama Buddha. The doctrines of the founder are too abstract for the average Tibetan mind, and this has led to innovations which have developed until the grossest superstition, little better than African fetishism, and bearing hardly any resemblance to the original precepts, is all one meets in the stronghold of Buddhism.

From Hemis we went to Chang Chemmo, where we picked up the depot of supplies that had been sent on, and then continued our way towards the Lanak La Pass. At first I thought we would have had difficulty in finding it, as a man who had been enlisted on his having offered to guide us there turned out to be totally ignorant of its position, and confessed that he had never been there. However, a Ladakhi, who had come with some hired transport, said he knew where it was, and being promised a reward, agreed to show us. Under his guidance we reached it, and crossed the frontier on July 3rd. The Kashmiri was completely knocked up from mountain sickness on the road and had to be sent back.

After crossing the frontier we kept on in an easterly direction to the Mangtza Cho Lake, which we reached on July 7th. The lake is a fine sheet of water of a deep indigo-blue, lying at an elevation of 16,540 feet. The water is salt, and the Tibetans come from Ladakh and Noh to gather the salt which is found in incrustations round the edge. We were fortunate in meeting no one, as had we met any of the inhabitants they would most assuredly have objected to our going further into their country, and difficulties might have arisen.

After leaving the lakes we kept on in an easterly direction up a wide open valley. Away to the north, standing out in the clear atmosphere and sparkling in the bright sunshine, magnificent snowfields were to be seen, while in front of us a range running north and south appeared to block the way completely. The Ladakhi, who had agreed to take us five marches further on, wanted to return; he said he was utterly ignorant of where we were or where we were likely to get to. However, when he discovered that he was to be held to his bargain, and would have to go on, whether he knew the road or not, he took the guidance of the caravan, and led us over the apparently formidable obstacle by a pass which, though 18,400 feet high, was still very easy. Descending the pass we found ourselves on the banks of a large lake, with several islands dotted about its surface, lying at an altitude of 17,930 feet, the highest lake we found in Tibet, and probably the highest in the world. To the south, a snowclad range, and on the other side low undulating hills were seen. Owing to the fact that the streams coming down from the snows enter at the south, the water at that end is much fresher than at the other; and as is invariably the case when fresh water is met with in these regions, gulls, bar-headed geese, and Brahminy ducks wheeling in the air uttering their discordant cries, gave life and animation to the scene. Leaving this lake behind we kept on, and in two days' time came to another large lake, close to which, finding a ravine containing fresh water and abundance of grass, I decided to halt for a day in order to rest the ponies. Here, as on many occasions, I found myself deceived as regards distance by the clear atmosphere. Thinking the lake to be about 3 miles distant I started for it, taking the necessary instruments to ascertain the altitude of its surface; but imagine my disgust to find that instead of being 3 miles off it was really about 9.

Next day we continued our way eastwards, and a very long, weary day it was. There was no water on the road, and in the afternoon the poor animals kept rushing into every watercourse, only to find them dry. Darkness came on before we had found any water, and convinced that wandering on in the dark indefinitely would not do, I gave the order to halt and started for the lake, picking my way over mud. On reaching the edge I tasted the water and found it as salt as the sea. We next tried digging, and got a little water which, though slightly fresher than the lake, was still of no use as a thirst quencher. There was nothing to do but to go to bed thirsty and trust that water would be found next day. Towards morning we were awoken by a hailstorm beating on our tents. A kettle was at once filled with the hailstones, and before long we were enjoying a cup of tea. Feeling thoroughly refreshed, we loaded up and continued our journey. Before going 5 miles we found a large spring of fresh water discharging an enormous volume into the lake; the poor animals who, alas, had received little benefit from the hailstones, simply rushed into it, and stood there drinking their fill.

While we were pitching camp, a black spot was made out on a distant hill-side. On bringing a glass to bear on it we found it to be a nomad's tent, round which some sheep were grazing. I at once sent over two men to procure guides if possible, and generally to make inquiries as to the route, etc. They returned, saying that there were no men at the tents, but only five women, who said that in five days we should reach the headquarters of the Khamba people, and that tents were to be met with all the way.

Next day we moved our tents over the river and pitched them close to the nomads. As we approached two men, who evidently had been hiding when my men had gone over, advanced to meet us. They were dressed in sheepskin robes, on their feet they had bright-coloured woollen stockings coming up to the knee and soled with yak's hide; their hair was in matted locks hanging down on each side of the face. Slung over their shoulders were long matchlocks with two-pronged rests on the end, and in their belts, stuck diagonally across the front of the body, they had straight swords in scabbards, ornamented with silver incrustations and turquoises; in their hands were long spears. These men were very anxious to know who we were and where we were going. I told them we were merchants and had lost our way in the mountains. They said that in a south-easterly direction lay Khamba, which was thickly inhabited by nomads; but they dared not take us there, as if they did they would assuredly have their throats cut for bringing strangers into the country, and the people would be sure to oppose us. In reply to my inquiries as to a road running east, they denied the existence of such a road; but they offered for 40 rupees to guide us in a southerly direction to a place called Sakhi, on the Leh-Lhasa road. Though this did not suit my plans at all, I pretended to fall in with the idea, and said, "All right; but it is a pity you cannot show us a road running east, in which case I would have given you more than double the amount." They then retired, but reappeared in about an hour, stating that after consultation amongst themselves they had discovered that there was a road running east, and were prepared to make a bargain to guide us for ten days along it. They were quite effusive in their friendliness, assuring us that they had deceived us at first under the impression that we were the advanced guard of an army; but now they had discovered their mistake and meant to be honest and above-board. A bargain was concluded with them, and under their guidance we resumed our march in an easterly direction. In three days we found ourselves on the banks of Lake Aru Cho, a noble sheet of water lying at an elevation of 17,150 feet. In every direction wild yak and antelope in incredible numbers were to be seen; but no trees and no signs of man. This peaceful-looking lake, never before seen by European eye, seems given over as a happy grazing-ground to wild animals—a veritable sportsman's paradise.

For one march we travelled north along the western edge, then turning east, leaving the lake behind, crossed a ridge and descended to a pool of water where we camped. During the night our new guides managed to desert. To attempt to follow them was out of the question, so there was nothing to do but endeavour to make the best of our way by ourselves. The great anxiety now preying on my mind was the uncertainty of finding water, as we had no one who knew the country. However, luck seemed to favour us in the most wonderful way, and day after day, when we were beginning to despair of finding any, we suddenly came on a spring or a pool of fresh water.

Another constant difficulty was the straying of the ponies. They had to be turned loose at night to graze or they never would have been able to march next day. Often when we got up in the morning one or two were missing, and search parties had to be sent out to seek for them. On one occasion six donkeys and eighteen ponies disappeared in the night leaving us perfectly stranded. We had to halt for four days scouring the country all round before they were recovered, and until they were found I much dreaded that nomads had stolen them.

Thus we journeyed for some weeks. The country was all of the same character—rounded, undulating hills with wide open valleys, and here and there sharply-defined snowy ranges. Game consisting of wild yak, kiang, Tibetan antelope, and gazelle, was exceedingly plentiful, and almost always in sight. But no signs of man were visible. At last on August 22nd the tracks of a party of nomads were seen. I sent two men to follow up the tracks and endeavour to obtain guides and supplies. The nomads received them with levelled matchlocks; but their hostility was overcome, and a bargain was nearly concluded when some other nomads suddenly appeared and opened fire on my men, the only result being that one bullet broke the leg of a Tibetan's pony. Though the nomads having fired off their matchlocks were quite at the mercy of my men who had breechloaders, these did not return the fire, as I had given them strict orders not to fire unless absolutely obliged to.

The character of all these nomads is much the same—greedy, faithless, and suspicious. Their suspicions do not attach only to foreigners; every camp seems to view every other camp as not only a possible but a very probable enemy.

After this provisions began to run out, and game unfortunately became scarcer, so all hands had to be put on reduced rations, and kiang, an animal something resembling a mule that we had formerly scorned, had to be shot for the pot.

Before many days were over more nomads were seen, and from them we managed to obtain some supplies; but they all viewed us with much suspicion. As we advanced the inhabitants of the tents came on with us, and before long we found ourselves escorted by about a hundred men

all armed with matchlock and sword. They endeavoured to induce us to halt, but I declined to do so until some responsible headman was met with. In this way we journeyed until August 31st, when we camped at a height of 15,621 feet. Early in the morning a poor mendicant Lama came over to our tents to ask for charity, and also probably to spy. He said that we had been wrongly informed as to the roads; the one to the south led to Tashi Lunpo (Shigatse), and to reach Lhasa it was necessary to go through a depression in the hills to the east. As this was more in accordance with my own observations, I came to the conclusion that he was telling the truth, and so we started off in that direction. The valley was studded with black tents, and herds of sheep and tame yak were grazing in every direction. Goa and kiang were also to be seen; but the former were very wild, the latter were in troops, and decidedly inquisitive. On reaching the head of the valley, we followed the bed of a rivulet fed by springs, which took us on to some high plateau-like ground, where we met once more our old friends, the Tibetan antelope: we had not seen any for some days, and it is evident that they do not often descend below 15,000 feet, and are decidedly scarce below 16,000 or 17,000 feet. In the night heavy rain fell, coming from the west.

On leaving camp next day we went through a narrow defile that opened out on a wide valley in which was an enormous lake. As we were approaching it, three mounted men caught us up; one of them appeared to be a sort of headman. He wanted to know all about us, and was not the least satisfied on being shown the Chinese passport, as he said that the year before, two Russians (by whom I presume he meant the two French travellers, M. Bonvalot, and Prince Henry of Orleans) had come into the country, also provided with a Chinese passport; that immediately afterwards information had come from China that a passport had inadvertently been issued, but that no notice was to be taken of it, and all Europeans were to be rigidly excluded. He then wanted us to halt while he communicated with some of his superiors. That I refused to do, and, at the same time, told him that our only reason for taking the Lhasa road was the necessity for obtaining provisions, our real intention being to go more to the north, and if he would supply everything wanted, we would continue travelling east and would pass to the north of Lhasa. However, he would not agree to this, and said he had heard from Lhasa that an English invasion of Tibet by the Chang was expected, and he suspected our party of being the advance guard. Near our camp there were three upright stones resembling those on Salisbury plain, and close to them were the foundations of several rectangular stone houses. I was much astonished at seeing them, as the highest flights in the architectural line that we had seen up to date were some old sheep pens; these had evidently been something of a very different class. In the evening more Tibetans arrived, and having

pitched their camp a little distance off, came over to try and induce us to halt, but being unsuccessful in their endeavours, departed.

Next day, soon after leaving the last camp, we found ourselves on the banks of a large stream flowing into the lake. Although it was cut up into many branches, it took us some time to find a ford, and then we only got over with difficulty; all our bedding and baggage got wet. Another stream, further on, though it did not hold nearly as much water, was almost as difficult to cross, owing to the stony nature of the bottom, and force of the current. After crossing it, we turned up a valley on the south, and camped. While we were pitching tents, a number of men, all armed with sword and matchlock, came up, and going a little bit ahead of us, camped. They were followed by a lot more, who camped on the other side, thus hemming us in completely. I sent two men to ask what they wanted, and received an answer that this was their country, and they were moving about in it—an answer that it was impossible to take exception to.

After a night of very heavy rain we continued our way up the valley. The following morning, as we were preparing to start, a zoung, or official, turned up, accompanied by a lesser light. He went to the Dokpas' tent, and sent four men to ask us who we were, and what we wanted in the country. To this I answered that, if he wanted to know, he had better come over himself, as I was not going to be interrogated by menial servants. On receiving my message the great man, accompanied by the lesser light, and a dozen of unwashed hangers-on, came over to our camp. I took them into my tent, and seated them on yakduns, after which they rather abruptly opened the conversation by asking, "Who are you, and what do you want here?" In reply to which I said, "We are English; we have come from Ladakh, are going to China; and here is our passport. We don't want to go to Lhasa, and have only come south to obtain provisions. Give us provisions and a guide, and we will continue our journey east."

The answer to this was that if we attempted to proceed they would be obliged to oppose us, as if they did not do so they would certainly lose their heads. If we fought and killed them, well it was just as good as being executed in Lhasa. They were absolutely immovable in this resolve, and I have not the slightest doubt would have attempted to stop our progress by force had we resolved to go on at all hazards. So I judged it better to come to some understanding with them, and after arguing over every trifling point and much circumlocution the following treaty was drawn up:—

(1) We were to be taken to a place three marches off in either an easterly or southerly direction, where water and grass were plentiful.

(2) Arrived there we would halt fifteen days, in order to allow matters to be settled in Lhasa, and allow any officials who might be sent to see us.

(3) During our halt we were to receive daily one sheep, 12 lbs. of flour, 12 lbs. of tsampa, and 1 lb. of butter; these things were to be supplied at a rate which they said was under market rates.

(4) The safety of ourselves and our property was guaranteed, and the value of anything stolen was to be paid to us.

After the treaty was drawn up, before they left I gave them each a small present, and hinted at the possibility of other and more valuable ones being forthcoming in the event of things being satisfactorily arranged.

They were both men of a very superior type to the wandering Dokpas: intellectually and physically they were fine men, and about both there was an air of pronounced individuality. As regards their dress, they wore the same kind of dingy red woollen garments ordinarily worn by Lamas; across the shoulder they had belts, on which were strung miniature shrines, about 7 inches by 4, containing prayers, etc. Their hair was in pigtails, much ornamented with turquoises, etc., and brushed well back from the head; quite a different style to the Dokpa fashion, where the pigtail is only an adjunct to a very rugged shock-like mass of hair, innocent of brush, comb, soap, or water. They made light of Chinese influence in Tibet, saying the only ruler in Tibet was the Deva Zhung (Central Government of Lhasa; the term is also sometimes applied to the Talai Lama). In the evening very heavy rain fell, and as no dry yak dung was to be found, we had great difficulty about cooking anything, and were reduced to burning the ridge-pole of a tent.

On September 5th our friends, the Tibetan dignitaries, were not ready to start with us, evidently indulging in that luxury, known in India as a Europe morning; but a small boy was sent to show us the way towards the place we had agreed to halt at. Marching in the same direction as ourselves was an enormous caravan, consisting of about four hundred yaks, fifty horses, and several thousand sheep. In reply to our inquiries they said they were a party of merchants, Chinese subjects, that their home was one month and a half distant, and that having brought goods into the country, they had exchanged them for live-stock which they were now taking back. However, some of the Tibetan officials' followers who had caught us up told a different story, saying that they were Chukpas (brigands), and that all the animals were the produce of industry in other paths than those of commerce, and the further apart we camped the better. So acting on this advice, after the sheep in wolves' clothing halted, we continued our march for another 8 miles, and camped on the banks of a stream flowing into a large lake. Numbers of nomads' black tents were to be seen in every direction.

Next day, a few miles after leaving camp forty-nine, we crossed a narrow neck of land between two lakes, the northern one of immense

size, while the southern one was of extremely irregular shape, having branches running up valleys in every direction, and islands, some of them fairly large, scattered about its surface. It was of singular beauty; and to the south a high cone-shaped peak, capped with snow, threw its shadow across; but what made the great difference that exists between it and other Tibetan lakes was the freshness of the water. Grass grows right down to the edge, and the invariable adjuncts of fresh-water gulls, and terns, wheeling about uttering cries, gave a feeling of life and animation contrasting strongly with the death-like solitude hanging over the salt lakes. It is almost impossible to get the correct names of places or lakes in Tibet, as every Tibetan lies on every occasion on which he does not see a good valid reason for telling the truth. Sometimes I have asked half-a-dozen men separately the name of a lake and received half-a-dozen different answers. The names I have put on my map are those in favour of which slightly more evidence was forthcoming than for others; but still some of them, including those of these lakes, may turn out to be erroneous, when further explorations have made us better acquainted with the country.

After leaving our last camp we crossed a narrow neck of land about the size of, and somewhat resembling, a railway embankment, with a lake on each side. A Tibetan, in the course of conversation with one of the caravan drivers, stated that the large lake on the north of which we were continually getting glimpses and occasionally extended views, was called *Tengri Nor* by Mongols and *Tengri Cho* by Tibetans; but I fear he lied. However, whatever the right name might be, there was no doubt of its being a noble sheet of water, stretching out east and west to an enormous distance; it seemed more worthy to be called an inland sea than a lake. But like all the Tibetan lakes, it showed signs of once having been larger than it is now; some of the lakes appear to have dwindled to about half their original size. Between it and our camp were some large lagoons of fresh water fed by streams coming down from the hills.

The escort seemed to grow in size every hour. Parties pouring out from all the side valleys fell in and came on with us. Though possibly they were not all intended to form a guard of honour, I thought it best to regard them as such, and hugged myself over the idea that we were being treated as distinguished guests. They were a quaint-looking lot, with long rifles terminating in a prong-like rest, to one arm of which was attached a red flag. Straight swords in scabbards encrusted with silver and studded with turquoises, stuck crossways in the front of their belts, prayer wheel in hand, dirty sheepskin raiment, hats that must have been introduced by a designer of garments for a burlesque, shock heads, pigtails, short stirrups and miniature steeds, all made up a picture, that though longing to photograph, I judged it wise not to for fear of exciting their suspicions.

From our camp a road ran southward to Lhasa, and people were continually passing backwards and forwards; one party said they were going to meet the dignitary of high rank that was expected out to interview us. As my passport was for Chinese Turkistan and mountains to south and west, I anticipated that when read, we should be allowed to take the way to the north and no other. The Tibetans sent over more supplies, consisting of a cake of brick tea, two pounds of butter and two sacks of nice dry cow-dung, but no flour or suttoo, those things not having arrived. However, they came next day, and brought a cake of a sort of Tibetan cheese; as Nebuchadnezzar said of the grass: "It may be wholesome, but it is not good." A plenipotentiary that I sent over to the Zoung's camp to fetch fuel, reported on returning that the old man had hinted that when permission came from Lhasa to proceed, he expected a trifling *douceur* in return for his trouble in providing a guide. So, rejoicing to find that he was civilised enough to understand the nature of a *douceur*, I sent a message that he need not fear on that score; as my knowledge of Tibetans increased my delicacy about suggesting gratuities decreased in beautiful arithmetical proportion. In order to try and find out the real name of the big lake, I instructed a caravan driver to get into conversation with the passers-by on the road and find out from them. The whole of Tibet could not have been instructed to give false answers, so barring the natural tendency of the people, there was nothing to prevent the real name being got at; but that natural tendency struck me as a pretty difficult obstacle when he returned, having interviewed several parties and got different names from each.

The Zoung paid us a state visit in the evening, and was very pressing in his inquiries as to where we had first met inhabitants. Evidently the arrival of Europeans had not been as quickly reported as it should have been, and he wanted to punish the delinquents; but, as we were dressed in Ladakh raiment, and the people always prefer to look at strangers from afar off, our not being spotted as Europeans was hardly to be wondered at. Next day, when we were starting off to pay a return visit to our friends, a messenger came over from their camp, asking us to postpone it, as they were very busy owing to important news having arrived. We were naturally curious as to what had happened, and the messenger showed no unwillingness to be communicative. It appeared that the Chukpas, whom we had passed on the road, not content with the enormous numbers of animals they had collected, had made another raid, and after killing several men had driven off two hundred yaks, fifty horses, and an enormous number of sheep. Such goings on close to Lhasa were unheard-of and occasioned great excitement. Meanwhile the Zoung was busy organising parties in order to endeavour to recover the stolen property. I suggested that as the Chukpas' herds were close by, the best plan would be to seize them; but it appeared that they had been

lifted in Kangri, a country away to the east, and as the Deva Zhung received a tax on each head driven through the Lhasa country, they were regarded as inviolable. However, as the Chukpas on their part undertook not to raid in the country near Lhasa and had broken their bond, I should have thought the Lhasa people would have been justified in breaking theirs also; but the Zoung looked at it differently. His idea was that the Chukpas having committed a breach of good manners, was no reason for his also doing so; but at the same time he would not hesitate to execute them if he got a chance. A Lama came to visit us, and was very strong in information regarding the names of places and other geographical facts; but the names and the facts differed very considerably from those given by other people. On the whole I was inclined to think him fairly truthful. He called the big lake in front Garing Cho, the district we were in Naksung Sittok; and to the east lay Doba, Numru Sera, and Nakehu. In the latter Shiabden Gomba is situated; from there two roads run towards China, one on the north to Sining, or as he called it, Gya Zilling, and a more southerly one of which he knew nothing. Chukpas abounded on the Sining road, and the general custom was for travellers to wait at Shiabden Gomba until several hundreds could be collected, and then cross the dangerous zone together for mutual protection. From Namru, a road runs to Lhasa, by which it would be possible to go straight into the sacred city without meeting a soul; but for us the Zoung and his small army put that out of the range of practical politics. Our arrival had created tremendous excitement. First of all, rumours spread that an English army was coming, next that it was only a party of Chinese travellers; and lastly, the true one, that we were English, but our objects were peaceful.

On September 27th the Kushok of Naksung, the expected colleague, turned up, and sent a man to call me over to his tent. I replied that if he wanted to see me he had better come to my tent. As I had waited twenty-one days for him, it was the least he could do. He came over, as I knew he would, the message having been simply an attempt to see if I could be bullied. Like all high dignitaries, he rode a mule, and held a bright red umbrella over his head. The latter much puzzled my orderly, who could not make out whether it was to keep off the sun or the rain, there being no signs of either at the time. The other Lhasa swell and our two old friends also came with him. My tent was prepared for their reception by neatly-arrayed yakduns, covered with scarlet blankets, to serve as seats. As soon as all hands were seated, business was promptly opened by the question, "Who are you, and where do you come from?" To which I replied, "We are English travellers; we had intended to pass more to the north, but, having run short of provisions, had steered towards the south, confident that, owing to the friendship existing between the British and Lhasa

Governments, we would receive every assistance." The answer to this was, that Tibet was forbidden ground to all strangers; that the only thing they would permit us to do was to return the way we had come at once; and as for the friendship existing between the two Governments, that was no reason why the people of both nations should not stick to their own countries. I then told them that it was of no use talking if they were going to introduce the subject of returning the way we had come.

Next day they came back again, and invited us to dinner the following day, an invitation which we accepted with much pleasure. On arriving at their camp, we were ushered in, and, after being seated on raised carpets, tea was produced. They drank it in Tibetan fashion, mixed with salt and butter; but, having found out from our servants the European fashion, they gave us some plain. After a considerable consumption of tea, bowls of mutton, boiled with rice and onions, were brought in. It was really excellent; but eating rice with chopsticks is an art that requires practice. The lower end of the tent was full of the denizens of the neighbouring ones, who walked in and out as if they were members of the great man's family. The whole scene had a very patriarchal air about it; and I was much struck with the respect shown by the common people to their superiors, continually bowing and sticking out their tongues when spoken to, that being the Tibetan mode of salutation. Before dining, and after the repast, the conversation turned upon the road we were to take. They maintained that if they allowed us to advance they would be executed on returning to Lhasa, while I stuck to my former statement that I would not go back a yard. Before leaving I invited them to dine next day with us. They agreed, and we made our exit amidst much bowing. They were pleasant, intelligent men, but exceedingly obstinate. When I pulled the Chinese passport out of my pocket, and asked them what was the meaning of the Amban's presence at Lhasa, if that was not to be read or to come into the discussion. They replied that the Amban was allowed to live at Lhasa as a visible sign of the friendship existing between the two countries; but Tibet was in no way under China. At the same time they produced a letter that had been sent after them from Lhasa, in which they were instructed to take no notice of any Chinese passport, but send us back the way we had come.

Other visits were exchanged. They asked many questions about England, and were much surprised to hear that it was surrounded by water, and that people went to it in ships. They had not the faintest idea what a ship was, and asked if it went through the water touching the bottom the whole way. Like true nomads they were particularly curious also about the water and grass.

Eventually they agreed to the following bargain :

We were to go back eight marches, and then travel east by a more northerly route. The Kushok was to accompany us for twelve marches, and after that we would be guided by four men, whom he would supply. We were to receive twenty ponies, 2160 lbs. tsamba, thirty sheep, 60 lbs. butter, 1100 lbs. barley, nine pairs pubboos (Tibetan boots). In return for all these I agreed to hand over 800 rupees.

As soon as the treaty was concluded, men were sent off in every direction to collect the supplies, and the headman of Shildut, who had been our original jailer, returned to his home. He was a nice old man, and I felt quite sorry at his departure. The rest of our time at Gaga Linchin was principally taken up taking over stores and transport animals. The ponies were sturdy beasts, about 12-2 hands, but were all a trifle long in the tooth; however, "never look a gift horse in the mouth," and if they lasted for three months, that was all we wanted. The Kushok rather astonished me one day by expressing admiration of our beards, and asking if we had any medicine that would make his grow. As anything like a decent beard is almost unknown in Tibet I should have thought a hairless face would have been more admired. The Lama was very anxious to know if we had any English poisons. Poisoning is very prevalent in Tibet. If one offers a man tea, he generally refuses it, unless someone first drinks a portion in his presence; and when offering anything to eat or drink a Tibetan invariably ostentatiously takes some in order to show there is nothing to be afraid of. We were also asked if gold, pearls, and rubies found a place in the European pharmacopoeia, and much surprise was expressed when Dr. Thorold assured them that they had no medicinal value. The Talai Lama is regularly dosed with medicines composed of those ingredients, so there is little to marvel at in Talai Lamas all dying young.

The tales Tibetans tell and I really think believe are sometimes most marvellous. We were told of a country not far off where men lived, who possessed only one arm and one leg, but no one would allow that he had seen any of these interesting people, and they would not even say in which direction the country lay, or how far off it was. Another wonderful country was one on the road to China, where the people had pigs' heads, but as with the other tale no one present had ever been there or seen the inhabitants thereof, though nearly everybody knew some one that had. Another story we were told was about a lake away to the north called Tso Ngom Mo, or the blue lake,—so large that it took thirty-five days to ride round. Formerly no lake existed, but some Chungpas lifted up a large flat stone and water immediately gushing out overran the country. An animal is found in the lake and nowhere else whose skin is of fabulous value. Once a year one has to be sent to the Emperor of China. Should it be omitted by any chance, several dignitaries would lose their heads, but no one seemed very clear about who were the dignitaries who were to be thus summarily punished for

neglect of duty towards the Sun of Heaven. I fancy the lake meant must have been Koko Nor, but it is terribly hard work trying to get geographical information out of Tibetans, for when, as in exceptional cases, it does occasionally happen, a vein of truth runs through their statements, it is so fine as to be almost impossible to discover.

Everything having been arranged, on October 4th we started to retrace our steps, and on the 12th, leaving our old route, we struck north.

On October 18th we managed to get over a snowy range that had been staring us in the face for several days. The pass was 18,768 feet high. There was not much snow on it, but the wind was bitterly cold, and no one took sufficient interest in scenery to linger on the top. After descending, the Tibetan yak-drivers wanted to halt at a place where there was very little grass and no water, but I insisted on their coming on until we got to water. A few miles further on we found a spring and camped. I then let them all go with a small gratuity, which much astonished and delighted them, the Tibetan custom being to requisition transport and pay nothing. We were now dependent on our own animals for carriage, the tow-rope being fairly cut and an uninhabited country in front. I sincerely hoped there were not going to be many high passes to be crossed, as nothing takes it out of horseflesh so much as struggling over high passes under heavy loads. Our old friends, the Tibetan antelope were once more to be seen. From the good service they had done us, in the commissariat line, I looked on them with respect.

It would take too long to tell of all the vicissitudes of our daily marches before once more we met inhabitants. The guides turned out to be quite ignorant of any road, and were only anxious to take us as far away from Lhasa as possible. Water was almost unprocurable, as what fresh water there was in the country in summer, was now all frozen, and fuel was not procurable in sufficient quantities to thaw it. The cold got daily more and more intense, the thermometer going down to 15° below zero with a wind that made us spend the nights in continual dread that the tents would be carried down. Minus 15° may not appear to be startlingly cold to those who have been in Canada, but with a temperature like that, the effect turns upon wind or no wind, and on the Chang a wind is almost always blowing. Day by day our animals knocked up and had to be abandoned or shot. When at last inhabitants were met with we all felt that a very few more days without assistance would have exhausted our marching powers.

On November 14th we met with nomads once more, and on that day for the first time for five months we camped below 15,000 feet, an occasion which, as water was abundant, I celebrated by washing, an eccentricity on my part that absolutely horrified the camp followers. It was a ceremony that, owing to the scarcity of water, we had only been able to perform at irregular intervals. From that time on we were always

able to obtain transport from the inhabitants from stage to stage, and one great anxiety was removed. As we proceeded eastwards we began to get among a more disagreeable people. Part of our route lay in Chinese territory, part in territory under Lhasa, and in some places the inhabitants owned allegiance to neither. Thieves abounded, and it was difficult to avoid getting into a row. In one place a man drew a sword on Dr. Thorold, and in another thirty men were discovered at night lying hid close to the camp, evidently intending to rush it as soon as they were certain we were all asleep. It is needless to say that we did not give them an opportunity of doing so. However, beyond losing some packages which were stolen, we reached the neighbourhood of Chiamdo without having had any trouble. During all the expedition, from start to finish, we never—though sorely tempted on several occasions—used violence to the natives.

On approaching Chiamdo we were met by a church dignitary, evidently of very high rank, arrayed in red garments, ornamented with gold embroidery and with a yellow cap on his head. On getting near he dismounted, and presenting a scarf of welcome said that the Amban had sent him with a request that we would be good enough to halt for a little at a house close by. I agreed to this and he galloped back whence he had come. We proceeded more leisurely, and on arrival at some barn-like buildings close to a bridge dismounted, and were ushered in, numbers of Lamas crowding round us. We were kept waiting there a few minutes, and were getting very impatient at the delay, when the Amban appeared. He was an extremely girlish-looking youth in appearance, manners, voice, and everything about him truly feminine: his mincing gait as he advanced, holding out his hand in a most extraordinary but no doubt very fashionable manner, quite took me aback. As soon as we were all seated, he asked whence we had come and where we were going. After being told he suddenly rose up and went out leaving us with the Lamas, a much more stiff-necked and difficult lot to deal with. They were a strikingly able and intellectual looking set of men; the two head ones especially had faces that would arrest attention anywhere. Education and the habit of ruling had no doubt done a good deal to mark men gifted by nature with talents above the ordinary run of their fellow-countrymen. They plunged at once into business and said, come what may they would not allow us to proceed along the road to China passing through Chiamdo, but they would give us every assistance if we would go by the route passing to the north which had been followed by M. Bonvalot and his companions. I told them I was determined to go straight on, and would not turn to the north for any one; as for Chiamdo, that it happened to be in the way was unfortunate, as I did not care a bit about seeing it, and if they liked I would promise not to enter any monastery; but we were going to China: this was the straight road, and I would go by it, and no other. They would not

agree to this at all and began tharetening, saying: "Advance, if you dare; we have three thousand men with guns and will soon stop you." I said, "All right; if you want fighting, you will get it; but straight forward we are going." Voices were being raised; both parties getting very angry, and it looked as if the fighting was going to begin then and there, when the Amban entered and peace was restored; he got the Lamas to leave the room, promising to settle the question with us. He was very easy to deal with, and inclined to agree to anything, but was terribly afraid of the Lamas; it was very evident that his authority was only a mere shadow. The arrangement come to with him was that we were not to enter the town, but to skirt it, rejoining the road on the further side. Soon after he had taken his departure he sent a man over saying he would like to have a talk with us quietly when no one was about, and would we receive him some time after dark. I sent back a message saying we would be delighted to see him at any time that he cared to come. About 9 P.M. he came over, and after we had seated him and given him tea, the conversation began. He assumed an extremely confidential tone, and said he would like to do everything in his power for us: that the English and Chinese were like brothers, and great friendship existed between their respective Governments, but the Lamas were a very turbulent set, and he really had no power at all, otherwise he would have taken us into Chiamdo and shown all the hospitality that was in his power. He trusted that we would realise the position he was placed in, and pardon his apparent want of friendliness. I told him that it was quite apparent what sort of people he had to deal with, and we quite understood the position he was placed in.

A few miles after passing Chiamdo we came to a village and halted, the Chinese Mandarin and about a couple of dozen monks escorting us. I determined to halt there for a day, but the monks objected strongly and once more began talking about the three thousand men with guns that they had, and threatened to bring them if we were not out of the place by daybreak. But it was only an attempt to intimidate us. We halted for the day and saw nothing of the three thousand musketeers, whose existence I began to consider rather problematical. But before we left, these extremely warlike monks who had been threatening us steadily, all appeared, and making humble obeisance sued for remuneration for the assistance given. What assistance they had given I failed to perceive, but as it is of vital importance in Tibet to conciliate the priesthood, I gave them some money and we parted the best of friends.

From Chiamdo to Batang the travelling was not very difficult, but the people in one or two places were exceedingly good hands at pilfering; any small unconsidered trifle left lying about for a minute disappeared. In this country Buddhism seems much more strongly impregnated with Hinduism than further east. On the stones composing manes

figures of Hindu gods are often seen, and in one house I saw a brass image of Ganesha. At the same place, on our arrival, the headman of the village meeting us inquired of the caravanbashi of what religion we were, and was told Buddhists. The headman hearing this said that he was very much pleased, as the only comfortable place for us to put up in was the idol house, but that their idol was very touchy, and if any one other than a Buddhist was to enter his house he would punish all the inhabitants of the valley. Though this idea of our being Buddhists had not been spread under my sanction, I determined more fully to utilise it by taking observations for position under the cloak of Buddhist ritual. Endeavours to take observations by stealth had previously failed, as had been evinced by stones landing round me during the operation. Now new tactics were adopted. The caravan drivers, all Mohammedans but thoroughly conversant with the details of the Buddhist religion, were mustered on the roof of the house, and put to chant the proper formula, while at intervals a bell was rung and a fire stirred up. Covered by these observances I manipulated, with the assistance of Atma Ram, the sub-surveyor, a theodolite and bullseye lantern, and thus managed to fix the position; while an odour of sanctity was spread round me that lasted for some time.

Between Achowa and Asi is a stretch of country much frequented by chukpas, the brigands of Tibet; there they lie in wait for caravans. We saw nothing of them, however, and they are very different men to what I take them to be if they would attack by daylight a caravan known to contain breechloaders. Many of the people from these parts fought against us in Sikhim, and have returned to their homes spreading tales of the marvellous effects of English rifles.

From Batang to Ta Chen Lu the road had previously been explored, and I have nothing new to add to what other travellers have written. What astonished me most was the enormous amount of tea met with on the road being taken to Lhasa, and the cheap price of gold at Litang, fourteen to one being the relative value of silver and gold.

At Ta Chen Lu, where there are three French Catholic missionaries, we entered China; meeting with Europeans once more was a great pleasure. I cannot say how much I am indebted to the missionaries for all the assistance they so kindly rendered in making arrangements for our onward journey; and whatever our religious views may be, no one can refuse a tribute of admiration to gentlemen of education who voluntarily exile themselves to a pestilential spot like Ta Chen Lu, in what they consider the performance of their duty.

From Ta Chen Lu we went to Ya Tu, on a branch of the Min River; thence by raft, boat, and steamer to Shanghai, which was reached on March 29th; then on to Calcutta and back to Simla, after an absence of twelve months and a half.

The caravan drivers returned to their homes in Ladakh *via* Pindi;
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parting with them was a painful business, and I shall ever think kindly of the men to whom I owe so much, and to whose steady, uncomplaining hard work the success of the expedition was principally due.

I shall conclude by a rapid glance at the general geography of Tibet.

The population of Tibet proper, *i.e.*, the country under the rule of the Deva Zhung, may be estimated at four millions. Chinese Tibet, including the province of Amdo, together with Kham, which is really governed by its own chiefs, and owns only a nominal allegiance to Lhasa, may be taken as holding another four millions, thus giving a total of eight million Tibetans, half in Tibet proper, and half outside it, of whom, probably, nearly half a million are monks. When one regards the size of the country in which these eight million people are contained, it is evident that it is very sparsely populated.

There are several reasons for this: the first is the custom of polyandry, which is largely, though not universally practised; the second is the large number of monks, who, though probably only nominally celibate, are forbidden to marry; and thirdly, although the country, especially in the East, could support a larger population than it does at present, still the greater part is only capable of supporting wild yak and antelope.

The whole of Central and Northern Tibet, and almost the whole of Western Tibet is known as the Chang. It consists of a high tableland with hills, mostly of a rounded character; but here and there sharply defined snowy ranges are met with. The mountains have a general east and west tendency, but no defined watershed exists; rivers may be met flowing in almost any direction, and all terminate in large salt lakes. These lakes appear to have been at one time much larger than they now are, as unmistakable signs that they are drying up are to be seen. An idea of the physical configuration of the country may be gathered from the fact that for five months we never once camped at a lower altitude than the summit of Mount Blanc; and all the enormous stretch of country we covered in that time contained not a single tree. The greater part of this Chang is, of course, uninhabitable for the greater part of the year, and most of the places that would afford grazing in summer are too far distant from suitable winter quarters to be availed of by the nomads. But round the edges a few are to be met with, living almost entirely on meat and dairy produce. Very rarely do they get anything in the way of flour, a very little "Tsampa" being the only starchy food their tents ever boast, and that is regarded as a luxury to be partaken of sparingly.

In South-eastern Tibet the country is of quite a different character; deeply-cut valleys, steep, well-wooded hills, and rivers that eventually find their way to the sea being the characteristics. The population is a settled one, living in houses and growing crops, but in character there is little difference between them and the nomads—faithless, immoral, cowardly, and untruthful; to those they are afraid of they are servile,

but to those they are not afraid of insolent. Their faithlessness and unreliability has often been shown in the way they have deserted the French missionaries, to whom they owed so much, whenever there was any sign of a disturbance. Their physique is distinctly good, and they appear to be able to stand almost any amount of cold and hunger; less industrious and skilful than the Chinese, they are still an active, lively people, and at first one is inclined to regard them as simple and light-hearted, but they are only simple as compared to their neighbours, the Chinese.

The dress of the common people consists generally of a long sheepskin robe very dirty and greasy; this is hitched up by a waist-belt during the day so that the upper part is very full, and the lower part hangs down like a kilt. At night they take off the belt and allow the robe to come down to their feet; it thus serves the double purpose of clothes by day and bedding by night. In warm weather, or what they consider warm weather, the right arm is bare, being thrust out of the coat; in the front of the waist-belt thrust across the body, a straight sword, in a scabbard ornamented with silver and inlaid with turquoises, is carried. On their feet they have boots, made of brightly-striped woollen cloth, coming up to the knee and kept there by garters. The love of ornaments and jewellery is a very marked trait in their character, and the amount of the precious metals used up in the country in that way must be very great. The richer people affect red woollen cloth and various-coloured silks.

As the Chinese in the country take unto themselves wives of the country, there must be a certain admixture of races, particularly on the main route to Lhasa, where there are a few Chinese stationed at each of the rest-houses; but the children seem to grow up thoroughly Tibetan, and travelling through the country one does not see any people having the aspect of half-breeds, though on inquiry people who are the result of these mixed marriages are pointed out. The fact that the Tibetans do not allow Chinese women to come into the country is of itself enough to show how shadowy are any claims the Chinese may have to the supreme sovereignty. I do not suppose anyone will advance the theory that the order issues from the Peking Government.

The rainfall and snowfall are fairly heavy, and during the short summer crisp grass springs up, exceedingly nourishing, as is often the case with grass growing upon a soil covered during a considerable portion of the year by snow. This grass maintains large numbers of yak, Tibetan antelope, and kiang, though it is difficult to conceive on what they subsist during the long winter months. Bird life is poorly represented, and the only game birds that appeared to breed there are the Tibetan sand-grouse and bar-headed goose; though in Eastern Tibet pheasants and partridges are numerous. Insects are scarce, a few butterflies and some bees of a sort that live underground being

about the only representatives of the tribe that we met with. A few of the butterflies were met with at an altitude of 17,000 feet, and it seems marvellous how anything so fragile could live on those bleak, wind-swept plateaux.

Of flowering plants one hundred and fifteen species were collected. One was found at an altitude of 19,000 feet, probably the highest altitude at which any flowering plant was collected. These one hundred and fifteen species contain twenty-eight natural orders, an unusual number, I believe, for such a small collection.

Round the edge of this great plateau a few nomads from the neighbouring lower country graze their herds in summer; but the interior is never visited except by occasional wandering bands of brigands who find it a convenient place whence to issue forth and surprise the nomads, and to retire to if pursued by the Lhasa authorities.

Towards the east after descending from the Chang a country of quite a different character is entered. The rounded, undulating bare hills give place to steep, well-wooded mountains; and in the deeply-cut valley rapidly-flowing rivers, with a general tendency in the same direction, and not in salt lakes, eventually find their way to the sea, while yak, antelope and bar-headed geese are succeeded by stags, pheasants and partridges. The country bears a great resemblance to many parts of Kashmir, and in beauty is at least equal.

Before the reading of the paper, General R. Strachey, who occupied the chair, spoke as follows:—This being a special meeting, there is no ordinary business to transact. Captain Bower will now give you an account of his very adventurous journey across Tibet. He may be said to have commenced his apprenticeship to travelling in these extremely difficult countries in what I believe was a chase after the murderer of Mr. Dalgleish, who was associated with Mr. Carey, one of the Gold Medallists of this Society. The country through which this journey was made is Tibet, a huge mountain mass covering an area as large—if not larger—than the continent of Europe, excluding Russia, and the length of Captain Bower's journey from the point of departure to its termination in China, is about 3000 miles. The journey, I need hardly say, was not like walking down Piccadilly; for at least half of the distance he was never below 14,000–15,000 feet. Very often it was above 15,000–16,000 feet, with the occasional diversion of passing a range of mountains larger than the Alps—larger a good deal than the Caucasus—a very large portion of the country being without inhabitants or vegetation, the most dreary and dismal country—so far as natural productions are concerned—that is to be found in the world, short of absolute sandy desert. I, probably, beside Captain Bower, am the only person here who has been into Tibet proper; but my experience was obtained upwards of forty years ago.

After the reading of the Paper, the following discussion took place:—

MR. H. SEEBOHM: Captain Bower has spoken very briefly and somewhat slightly of the birds which he found on this great journey. You will be interested in hearing that the small collection, entirely consisting of game birds—for they had not cartridges enough to allow them to shoot anything which they did not think fit to eat—is perhaps the most interesting collection which has ever been obtained, if we

except the collections of game birds which have been obtained on the various journeys of Colonel Prjevalsky in the northern part of Tibet. They consist of only seven species, but all of extreme rarity. We have first Bonvalot's Eared Pheasant, a very handsome bird, with a great deal of white upon the tail, which has only once been previously obtained, and that but quite recently, by M. Bonvalot and Prince Henri of Orleans, almost in the same locality. The second is L'Abbé David's Eared Pheasant, which was only known for a great many years from the solitary example in the British Museum, of which the exact locality was not known, but which was afterwards obtained in considerable quantities at Moupin by L'Abbé David, the great French ornithologist. Another very interesting bird is a kind of Snow Partridge. Although it is not a true partridge, it is very nearly allied to them, forming a link between the snow partridge and the grouse. It was only previously known from two or three examples obtained by Count Szechenyi, the Austro-Hungarian traveller, who made an unsuccessful attempt some years ago to reach Lhasa from China. Then there is Dr. Anderson's Pheasant, an equally rare bird, discovered in Yunnan, the typical example of which is in the Calcutta Museum, the only other two specimens which are known to exist being sent alive to the Zoological Gardens in London from some part of Western China, the exact locality being unknown. There is also General Prjevalsky's Partridge, allied to an Himalayan species, and which was discovered by him on the Nan Shan Mountains, which, you are aware, lie to the east of the Kuen Lun; and Dabry's Blood Pheasant which was discovered at Moukin by the French Consul at Hankow; and, finally, three examples of the Tibetan sand grouse, not brought home by either Captain Bower or Dr. Thorold, but which they frequently saw upon the journey—a bird closely allied to the sand grouse, and which has made two great migrations to Europe within the last five and twenty years. The Tibetan Sand Grouse was discovered by Lord Gifford some years ago, who, you will remember, was the elder brother of one of the greatest Indian ornithologists, the late Lord Tweeddale. The collection, though extremely small, is of most unique interest.

General J. T. WALKER: It is scarcely necessary to remind an audience like this of the importance attached for many years past to our knowledge of the geography of Tibet, a region little known partly because of political difficulties raised by the Lamas in regard to any Europeans travelling through their country, but mainly because of the formidable nature of the country itself. It is enormously elevated, the plains reaching 18,000 feet above the sea-level, and mountains rising considerably above that. Tibet is most accessible from the south, the Himalayan regions; but all attempts on the part of Europeans to enter the country from that direction have failed owing to the opposition of the Lamas. All Europeans who have entered the country hitherto, until Captain Bower made the remarkable expedition of which he has given us an account this evening, have entered from the north. From the north Huc and Gabet entered and made their way down to Lhasa, the only Europeans with one exception who ever reached Lhasa, a century ago. Then the celebrated Russian traveller General Prjevalsky, two Englishmen Messrs. Carey and Dalgleish, two Frenchmen M. Bonvalot and Prince Henri of Orleans, and, later, the American traveller, Mr. Rockhill, all crossed that great belt of Tibet to the north, a belt of country stretching over 20° from east to west, with a breadth nowhere less than 100 miles, often much more, whose height is nowhere less than 14,000 feet, and which is entirely uninhabited, so that when travellers pass through it they have to take all the necessities of life with them. Captain Bower entered Tibet from the west, on a line considerably north of that taken before by Pandit Nain Singh in his travels, and he has explored at least 800 miles of country never before touched by any European, or even by any of

the Asiatic explorers of the Indian Survey Department. His courage and enterprise have enabled him to perform a very successful journey, and I think we are all greatly to be congratulated on the result of his efforts.

MR. DELMAR MORGAN: The paper we have listened to is one not only of great geographical interest but of great importance, because it shows what may be done by a European in the Trans-Himalayan country. It has been stated, and frequently reiterated, that access to these regions is impracticable owing to the obstinate exclusiveness of the natives or their rulers, and that if it is to be explored at all in the interests of science it must only be by trained native surveyors. I have always been of opinion, and have before remarked here, that these natives, however valuable some of their work may be, and however carefully trained in the use of instruments, cannot bring us that accurate information as to these countries which we require. They seem to lack that spirit of critical inquiry, and that fertility of resource, that distinguish the European traveller, and open to him as if by magic the most jealously guarded regions. Of the native surveyors, the only one to travel along a route parallel to Captain Bower's was Nain Singh in 1874-5, and since then there have been no attempts to open Tibet from the Indian side except by the Pandit A K, and to reduce the limits of that wide tract of unknown land marked as a blank on our maps between the 30° and 40° parallels. All the information we possess concerning it comes from foreign sources—from the Russian traveller, General Prjevalsky, from the Austrian Count Szchenyi, from the daring expedition of Prince Henri of Orleans, and M. Bonvalot, and lastly from Mr. Rockhill, whom we are to have the pleasure of hearing next Monday. All these travellers coming from the north succeeded in crossing the most difficult and dangerous parts only to be turned back when they reached the Lhasa governed district. The lesson that may be learned from their narratives is that there are no insuperable obstacles to entering these regions beyond the hardships and privations incident to travel in a very elevated region, and in a wild almost uninhabited country. The real difficulties begin when the traveller reaches a short distance from Lhasa, and Captain Bower's journey, resulting in a great access to our geographical knowledge, strengthens the conviction that the difficulties in the way of its exploration have been greatly exaggerated, and proceed not from the exclusiveness of the natives, nor from Chinese intrigues, but are rather due to the apathy and indifference at home. There seems to be a fear of diverging from beaten tracks and departure from established precedent. The earlier stages of Captain Bower's journey coincide very closely with those of Messrs. Carey and Dalglish, but unlike those travellers who turned northward when they reached the Tibetan plateau, and descended to Keria, Captain Bower continued nearly due east and explored that long chain of lakes heard of by Nain Singh, but hitherto only roughly marked on our maps. He has brought us some very valuable geographical information and has also shown us what are the conditions under which travel may be successfully prosecuted in these regions; he has further confirmed the statements of General Prjevalsky and Mr. Rockhill that vast numbers of wild animals exist in these regions, a fact denied some years ago by so eminent an authority as our Chairman to-night. It is to be hoped that the Geographical Society will take to heart the lessons given us this evening, and, abandoning their indifference to the exploration of these regions north of the Himalayas, seriously take in hand the task of exploring and mapping the yet unexplored portion of North Tibet.

Note.—It is a remarkable fact that the last European to travel along the same route as that taken by Captain Bower was Père Desideri, of the Society of Jesus. His starting-point was also Leh, and he travelled to Lhasa in the company of a Tibetan princess. This was in 1715. No European has, to the best of my know-

ledge, attempted to follow in his footsteps till the other day, when Captain Bower and Dr. Thorold reached a point within a few marches of Lhasa.

MR. D. FRESHFIELD: At this hour I can say but very few words, and I rise principally to express my regret at the absence of my predecessor in office, Mr. Markham, who has done so much to interest the public in the exploration of Tibet. I think we must all feel at times, however keen Africans we may be, that there is pleasure in a change of scene. To-night we have been transported from the plains and palm-groves of Africa to a country which is not a field of missionary enterprise, but which is instructing us in Theosophy, where we do not look down upon low forms of civilisation, but up to, perhaps, the most perfect form of home rule that exists on the face of the earth, to a country nominally owing allegiance to Peking, but practically governed by the local priesthood. Ever since I read Charles Lamb's letter to his friend Manning, sympathising with him on being amongst "cold, insipid, smouchy Tartars," Tibet has had a peculiar interest for me. We all have to thank the Indian Government for having to a certain extent made a new departure in sending home an officer with leave to describe what he has seen, and also for having removed some of the obstacles to the publication of the descriptions given of Tibet by its native servants. One of them, Chandra Dass, has in a report now in print informed us, how not being under the same difficulties as Europeans, he penetrated into Lhasa and saw all its golden monasteries and temples, and took tea with the Grand Lama himself. I hope this work will soon be in your hands, and then you will be able to appreciate it.

This day week we are going to have another paper on Tibet—owing to the necessity of meeting travellers' conveniences we are obliged to put them close together—we are going to return to this country under peculiarly interesting circumstances, for the Council also have made a new departure, and have invited a most enterprising American traveller to come over to address you. Next week, therefore, we hope to have Mr. Rockhill, who invaded Tibet from the eastern side, and made two remarkable attempts to get to Lhasa or through to Darjiling, who will give us valuable information supplementing that given to us to-night. Under these circumstances before long we may be able to present a volume on Tibet to our Fellows, which will furnish a mass of information as to this remote, ancient and primitive region, which will not yield in interest even to the more romantic narratives of African travel.

GENERAL STRACHEY: It is not necessary for me to invite you to thank Captain Bower for the extremely interesting account of the remarkable journey he has made, through a country that is perhaps one of the most difficult in the world. I would say a few words as to the result of this journey from a geographical point of view, as it strikes me. From about long. 91° Eastern Tibet is traversed by a great network of rivers flowing eastward into the ocean; from about 80° the water flows in the opposite direction to the Indus. Between 80° and 90° there is a great area from which no water escapes to the sea, and through this region Captain Bower's journey has been made, and it gives us for the first time information from actual observation we have long wanted, and supplies what I may call a sample of Central Tibet, and shows that the old maps of the country, as obtained from the Chinese, are fundamentally correct. It is a great region covered with lakes with no flowing streams. What Captain Bower has really done is to give us for the first time direct evidence of the truth of the main features of that wonderfully great map which is due to Chinese geographers, and is a wonderful illustration of the extreme ingenuity of that remarkable people. You will, I know, thank Captain Bower for his extremely interesting paper, and recognise the courage and perseverance which has enabled him to carry through this remarkable exploration.

CAPTAIN BOWER'S PLANTS.—The following note on the plants collected during Captain Bower's expedition has been presented by Mr. W. T. Thiselton Dyer, C.M.G., C.I.E., Director of the Royal Gardens, Kew :—

Kew, Feb. 25th, 1893.

There were about one hundred and thirty species. The whole collection will be carefully worked out for the 'Annals of Botany.' There is a large proportion of Himalayan plants, including many described by Sir J. Hooker and Dr. Thomson, and Jacquemont, a Central Asian element, and a touch of North China. There are about half-a-dozen absolute novelties. One a curious new grass, *Agropyrum thoroldianum*. There is a new iris, *I. Thoroldi*.

Dr. Thorold says that the collection included every plant that he saw. In that case the generic flora must be very meagre.

CAPTAIN BOWER'S MAP.—The position of camps marked thus ● was obtained by astronomical observations and dead reckoning. The heights were taken by hypsometer.

The map is reduced from official documents issued by the Survey of India Department.

FURTHER ROUTES IN THE EASTERN DESERT OF EGYPT.*

By ERNEST A. FLOYER, Leader of the Scientific Expedition
despatched by H.H. The Khedive of Egypt.

It was not until February, 1891, that the Government of His Highness The Khedive decided to despatch an expedition to continue the explorations begun in 1887. Rendezvous was made at Assuan, where everything was prepared by the care of His Excellency Wodehouse Pasha, Governor-General of the Frontier; and on February 13th the expedition started. The existing maps contradicted each other on many essential points, and it was decided to follow that of the British War Office, which laid down one or two definite wells which the Arab with us recognised, and to which he was ready to conduct us. Abrak was a well which was known to have a great store of sweet water, and for Abrak we steered on leaving the Nile Valley. The first day we moved a short distance up the Bab el 'Ajjaj, the "Pass of the Sand-driving Wind," and camped to collect stragglers.

The rocks on either side of the valley, which broadened out at 8 miles from Assuan, were chiefly diorite, granite, and dolerite. At 14 miles the valley forked. We left the Hud † Valley on our right, and

* See *Proceedings R.G.S.* 1887, p. 659. Map p. 480.

† The prophet Hud, identical with Heber, fourth in descent from Noah. His tomb is near Mirbath in Yemen.

followed the 'Ajjāḡ up a gradual ascent, until at 20 miles we quitted the rounded mass of Archæan rock, and opened on a broad sandstone plateau some 900 feet above the sea, sloping gradually down to 750 feet in the Allowi Basin, and thence gradually rising again. Here was the head of the Wadi Allowi, which springs some 10 miles to the south-east, and, winding over the almost level plain, goes north to join the Wadi Khareit, which falls into the Nile at Darawi.

On this route from Assuan to Abrak all the drainage, until the watershed is crossed, runs to the north. The small, shallow, water-courses, merely marked in the sand by a line of grass or shrubs, all run northward to join the Wadi Gharara, which is a large tributary to the



THE WADI HAMATA FAR FROM ITS SOURCE.

Wadi Khareit. The four principal valleys west of the watershed are the following:—

The Wadi Allaki, where are the gold mines described by Agatharchides, springs from the mountains of Elba, and reaches the Nile a few miles south of Assuan. This is the centre of one great westward drainage system.

The Wadi Khareit, springing from the Berenice Mountains, and reaching the Nile at Daraw, is the centre of a second drainage system.

The Wadi Abbad, springing from Jebel Abu Diab, drains a third basin; and the Wadi Zeidun, springing from the Jebel Sabā'i, and reaching the Nile between Kos and Kina, is a fourth. North of this is the Wadi Kina, described in the *Proceedings* of November, 1887.

While marching from Assuan to Abrak, we travelled apparently

over a boundless sandy plain; but in reality we were passing along the southern flank of the drainage basin of the Wadi Khareir. At 35 miles we left the last branch of the Allowi and entered sandstone ridges running north-west and south-east, with horizontal bedding, and some 300 feet of height. These ridges are a feature of this desert. Here petrified wood was common, as also 50 miles further on. The route over this sandstone plain may be readily followed on the map. Some uneasiness arose at the amount of southing made, and the wells of Abu Hashim were, if still ahead, far from their position on the map. They were reached, however, on February 17th.* From here the level sandstone plateau became more broken, and in 12 miles from Abu Hashim we reached the Wadi Timsa, so called from a long low bluff, something in the shape of a crocodile, which is the meaning of the word. Here in the rocks is a "galt" or reservoir, which holds water for a long time, but was now dry.

Passing over the undulating sandstone we crossed the broad Fileiti Plain, a desert among deserts, and approached more sandstone ridges always running north-west and south-east, and against whose flanks the drifted sand was piled up high like yellow snow, blown over from behind the hills by northerly winds. It was to no purpose that we climbed the highest points of the sandstone ridges, and searched the horizon for some prominent peak or land-mark. Sometimes in the far distance a peak or range loomed shadowy and blue. But the guide could not name them, nor could cross-bearings be obtained, except in one case, to Jebel Horuba (spear). On the evening of the 18th we climbed up a low ridge, crossed the watershed at about 1400 feet, and entered a broken country full of trees. The vast desert was at last at an end, and we were nearing Abrak. Here were many trees and shrubs, seyal, sellim, murkh, irta and shush, the last two most nourishing fodder, and the first most excellent firewood. This we had much needed, and that evening we camped in a fine sporting country and sat over a fire of logs.

We pushed on across the watershed and descended the slope, still on the sandstone rocks, and, on the morning of the 19th, reached the pools of Abrak, which we determined by astronomical observations to be 54 miles from their position on the map. But the position thus found was very close to the "Abiag" wells determined in 1878 by Mason, Colston and Purdy, American officers in the late Egyptian Army. "Abiag" was a misprint on the map; the word was correctly spelt in the report as Abrak.

Abrak is a picturesque valley, a cleft mass of sandstone wedged in between granite hills. The water-supply is probably permanent, and the place has been held as a strong place from the earliest times. There

* Details of the wells are given on the map.

are the remains of a large fort on a point at the mouth of the valley. Sandstone next to granite is in this country the surest combination for water. The granite throws it off and the sandstone absorbs it in its softer veins and in the pebble layers. Nor are the two pools mentioned the only supply in this neighbourhood. Skirting round the mass of Jebel Jambai, with Purdy's map in hand, we reached the grand Wadi Hothein which runs to the sea past the Jebel Ferayeg, the πεντεδάκτυλον ὄρος of Ptolemy Claudius. Here, at the foot of a lofty cliff, walling on the north the valley formed by the junction of the Hothein and the 'Anid, is a carved portal with an obliterated Greek inscription. The sockets are seen of beams which roofed in a spring of sweet water still maintaining two or three palm trees. A good engraving of this picturesque well is given by Linant de Bellefonds, who describes the place as an elephant-hunting station of Ptolemy Euergetes, B.C. 146. It is not, however, probable that elephants were found so far north in his time. It is possible that when the ocean surface of the world was wider, the monsoon rains spread farther north than now. The horse, cow, ostrich, and wild donkey, have disappeared from this country, not, however, by a diminished rainfall, but perhaps expelled by the camel. Um Safa, the modern name of the well, may have been a station on the road to the elephant-hunting countries in the south; and to possess elephants was a ruling passion with Euergetes. Since Alexander the Great showed their value in war, and since Seleucus, King of Syria, had received a present of five hundred from Sandrocottus, King of India, Egyptian rulers spared no pains to procure these mammoths from their own mountains. But they had no success, nor would the hunters of the south desist from the destruction of these animals, which was deplored then as now.

The valley Hothein (two pools), which, thirteen years ago, Colston found full of luxuriant shady trees, is now barren but for a few large rugged-stemmed calotropis. Purdy called the great cliff of Um Safa the "Istahkamat," or fortifications, and it was thought becoming to commemorate the name of the dead soldier and explorer by giving his name to one of the five "fingers" of Pentadactylon, now called Jebel Ferayeg. The southern peak is named by the Admiralty "Bodkin," and this great needle is a landmark for 50 miles round. The next peak has been inserted on the map as Purdy peak.

The Wadi 'Anid gives a route westward to the Dagalawi hills, and to El Gala, possibly some ruined mining station; and eastward, after its junction with the Hothein, it runs to the sea past the "Bodkin." The eastern or seaward route hence to Berenice had been laid down by Purdy's expedition to Berber; and a verification of his work near Abrak showed that little new could be found in his footsteps. So we started almost due north along the crest, heading for a mass of hills from which the great blunt cone of Abu Gurdi, 5000 feet, gradually rose into prominence as we approached. We crossed the Wadi Na'am, or

ostrich valley, and some of its affluents, and followed up the Wadi Beta'an to its source near Jebel Abu Dhaher, so named from its ridge like a camel's hump. Here we made an interesting discovery of a large mining settlement, the first of a great number which we afterwards visited. The place is called Um Eleagha, the latter word meaning a shrub, the *Vigna Nilotica*, which is found there.

The great ridge of Abu Dhaher is formed of a porphyroid rock. To the south-west is an undulating surface of clay and schists veined by thick dykes of quartz. Here, as was later found to be most usually the case, are traces of two distinct mining periods. The quartz veins have been burrowed out by an ancient people who lived in clusters of small stone huts; and after their departure, mines have been opened by European miners, who lived in a square-built town or barracks. The neighbourhood of a mining town is first denoted by scattered remains of stone huts. These may have served the sutlers, or hangers-on of the settlement. Somewhere near the main shafts will be found a square or oblong-walled enclosure perhaps 300 yards square. Then the temple must be looked for, and it is sometimes difficult to tell whether the temple was left incomplete or has fallen in ruins.

At Um Eleagha, we first noticed small stone huts; and, on inquiry, were told that near the mountain were "kufra," ancient ruins. The etymology of this word is too curious to be omitted; it is given by Doughty in his wonderful 'Arabia Deserta,' which reads like an old testament of modern days. At Medain Sali are found some vast sepulchres of a pre-Islamic race. They are described by the Arabs as the houses of the Kuffar, or Kufra—that is of unbelievers who lived before Muhammad's divine missions. The same word has thus come to mean ancient ruins and unbelievers. On hearing of the Kufra we at once halted, and after a short search found the town, or barracks. The shafts were some hundreds of circular holes, from 10 to 25 feet deep, and had been much deeper before they were filled with the sand of centuries. They were scattered about thickly over an undulating surface of green granite schist. One shaft descended very steeply in solid-green granite and had a square-hewn mouth. No conclusion was come to as to what the miners were in search of; but the quartz veins which crossed the plain had clearly been worked for gold.

The temple could not be found, and remains to reward the future traveller. It was described, after we had left the place, as, "a large building, plastered." We pursued our route northward over a desolate sandy land. Here and there were "rothas" meadows, or flat sandy depressions, well stocked with "shush" * grass, on which grazed scanty flocks of sheep and goats. The nights were cold on the crest, at a height of about 1400 feet. Here were huge cones of quartz, regular

* The botanical names corresponding with these Arabic names are given on the map.

in shape, 300 feet high, and of a delicate rose pink. Approaching the mass of Abu Gurdi the rocks took a peculiar form, which prevails largely over the crystalline area, and which will be referred to as "cataract rocks." Strabo noticed this peculiar rock on his waggon ride from Assuan to the cataract, and described it in detail. Colston writes, "One would think that here had been a cataract." The rock is a coarse grey granite; the felspar and mica crystals very large, the latter causing it to disintegrate very rapidly. It is worn away into caverns and potholes in a way suggesting immediately the action of water. There are curious stains on it, compared by the Arabs to leprosy. They are caused by a larger proportion of hornblende, the quantity of which in the main mass is very small.

After rounding the base of Abu Gurdi the Lehema joins the Safint, and the two roll down a broad stream of boulders, and, once every



WADI LEHEMA.

five or six years, of water so deep and rapid that though a camel may, a man may not cross it; such a "seyl" lasts for two days. The Wadi is thickly planted with fine seyal trees.* The boulders in the upper part diminish gradually to gravel, and sand in the lower parts. Some days were spent in examining this and other wadis flowing seawards from the Berenice Range. They all flow north-east, and all seem to be fissures in the primary rock partly filled by detritus. We marched eastward, and on the night of February 28th we climbed up the highest peaks near the camp, but could catch no glimpse of the Red Sea, which one of us was to see for the first time from the ruins of Berenice.

There is very little to mark out Berenice in the flat sandy plain.

* The name "Lehema" is the Abyssinian name for *Tatena Montana*, which probably grew in this valley.

Belzoni, who found the site in 1819-1820, had extraordinarily good luck. Two or three outcrops of cataract granite were a disappointment from their resemblance to ruins. At last, a little before noon, our camels were stopped actually on the roof of the temple. This had been cleared of sand by Purdy in 1878; but was once more nearly filled up. All around the traces of houses were like heaps of stone roots. Blocks of coral in this form had been employed as stones, and now had the curious appearance of heaps of roots.



Berenice was supplied with water by a large reservoir built in the bed of a neighbouring wadi, according to the plan made by Purdy's expedition.

The great truncated cone of Abu Gurdi bore due west from the ruined town, and turned the whole drainage east of the watershed in a north-east direction. Around it lay a great mass of lesser mountains, among which was conspicuous the Batoga Peak of light buff colour. Both north-west and south-west are forts of massive strength, indicating the passage of caravans of precious metal from both directions, and that the passage was dangerous owing probably to attacks by the Blemmyes, the Hamitic wanderers who held these deserts.

It was interesting to find here a range of mountains called the Jebel Aidab. Curiosity had been strongly excited by long stories in the Arab historians of the tenth and eleventh centuries about the Port of Aidab, which was not to be found on any map. From Aidab to Jeddah was but a day and a night's sail, and for two hundred years—1060-1260—the Kos-Aidab route carried the whole pilgrim traffic; and still for a hundred years longer it carried all the merchandise from the East. The probable position of Aidab is discussed at great length by the Arab geographers, Ibn Haukal doubting whether or not it is in Abyssinia. It may be that this is the real site of the old town. If so it is curious that it required two expeditions to actually place it. Purdy, coming from the north, marked "ruins of an Arab town." We, advancing from the south, rode along the flanks of Jebel Aidab, at the foot of which lay the ruins of Aidab. But, on reference to Von Henglin's map, it is found that Aidab is a very common name on this coast, and may even be a word meaning mountain. Thus the identification is incomplete.

From Berenice we moved north to the point where the W. Lehema leaves the hills and makes a broad line of stunted shrubs to the sea. Abu Geraia, the place (father) of the hamlet, is a fortified station at the mouth of a narrow valley. The well (dry) is $1\frac{1}{2}$ miles up the valley from the station; and the cliffs overlooking it are cut and built into ambushes for sharpshooters. Here was a clue to the meaning of a tall tower near the deep-built well at the quarries of Mons Claudianus. This tower, now inaccessible, and without staircase, has puzzled

travellers.* It was probably manned by watchmen, who were drawn up by a rope into the upper chamber, and who shot with bows at those who would draw water without orders. From here the expedition began an examination of the mass of hills which may well bear—beside the native name of each hill, the collective name of the Berenice mountains. The chief peaks are Abu Gurdi, Aidab, Safint, Um Selim,† Hamata, Hullus, and the twin peaks of Hamamid. Marching up the broad W. Lehema, a small hill to the right was called Jebel Zayetit. This is probably the "etit" of Schweinfurth, and the "Outidh" of the French War Office map.

We proposed to camp in the well-treed Wadi Lehema, and await the arrival of some photograph apparatus which was following from Assuan. Here, in spite of the guide's denial, we found a galt, which contained 13,000 gallons of delicious water.

Three days were spent in taking bearings, and Haji Mansur proved a capital geographer. It was a keen pleasure to him to carry the plane-table up the highest hills from whence the greatest number of peaks could be seen. He was never at fault, and would name the hills and state whether the drainage ran "sahil," coastwards, or "dhahir," westwards. Something he knew, too, of geology; and could name granite, schist, slate, quartz, mica, limestone, and sandstone. He could not, however, go wholly with modern science. On the relative ages of rocks, modern science must take its way; he reluctantly turned aside, and stood aloof. The granite might perhaps be a thousand years old and the sandstone perhaps a little more. Argument he answered by donning his scarlet coat, a robe of honour from the Khedive, and thought that a self-respecting sheikh must not be teased by obvious fables. One evening with his help we actually rode down, on camels, an ibex. But the old veteran was dying of age. His knees had pads like a camels, and his beard was a foot long.

Having completed our instruments the party divided. The main food supply started for Haratreit well. I went round the mass of Abu Gurdi to the source of the Wadi Khareit, and thence across the difficult Mikbia' pass, and joined the party at Haratreit, where it was cool lying (we had no tents) under giant boulders of grey granite. The Mikbia' pass, 2500 feet, is difficult, and, if loaded camels are taken across, it must be one by one, with many camelmen, and camels accustomed to hills must be chosen. There are some fine bold passes in the Wadi Mikbia'. The Haratreit Valley was cut very deep into the soft grey granite,

* See *Proceedings R.G.S.*, November, 1887.

† Um Selim, mother or place of *Acacia Ehrenbergiana*, a common name for mountains and perhaps the origin of the Solymi mountains of the ancients.

τὸν δ' ἐξ Αἰθιοπίας ἀνὰ κρητὰς Ἑνοσίχθων
τηλόθεν ἐκ Σολύμων ὁρίων ἴδεν.—*Odyss.* v. 282-3.

and for geological purposes we followed it to the sea, where was a fine grove of avicenna, containing trees some $4\frac{1}{2}$ feet round the bole. It was a curious forest there in the shallow sea. The bright green leaves shone in the sun. Curlews, and other waders, wandered tamely about, and far away over the flat sea—there are no waves on these coral protected shores—were two or three tiny canoes of fishing Ababdi.* These fishermen watered at our well, 9 miles inland, and came there with water-skins on camels and donkeys. They had perhaps a story to tell, but the knowledge of ships' wreckage stored in their huts, added to an instinctive reticence, prevented anything coming from them. They were small, dark-coloured, and scanty-bearded; active and well made.

Travelling now from Haratreit, over low hills and broken slopes of granite, we struck the Wadi Hamata,† and turned aside to visit the great mountain of that name, which means a wild fig, and is probably referred to the shape of the mountain, which is 6000 feet high and dome-shaped, or like an inverted fig. The summit was wrapped in fleecy clouds, and the view that morning was grand and picturesque, but could not be reproduced by a photograph.

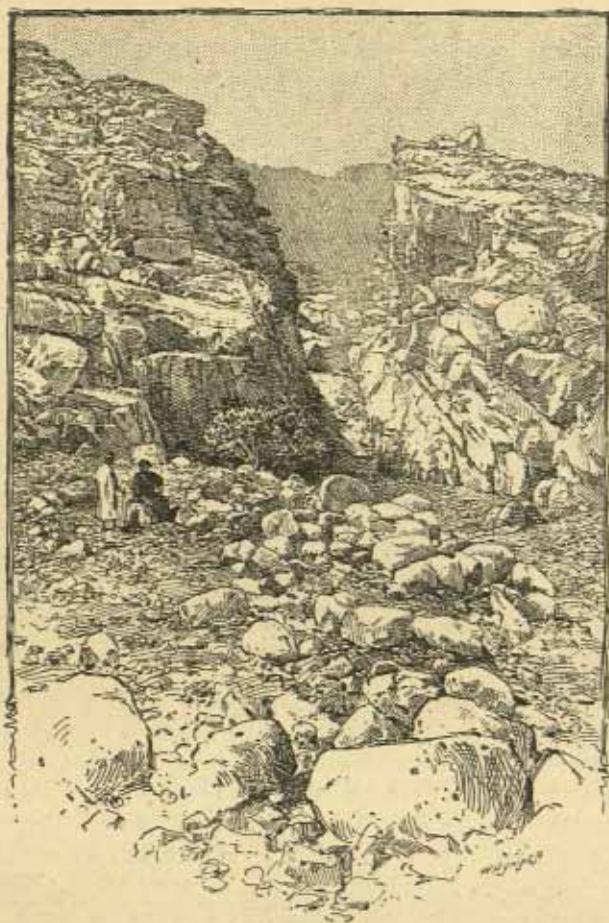
Nearing the hills the boulders became very large, and the camels moved very slowly. Here was a ragged Abbadi hut, sure sign of water, which indeed we found plentiful, but green. A broad ravine, floored with polished gneiss, runs down the mountain side, making in its smooth bed three or four waterholes, of which the largest held 600 gallons. But alas, many things beside water had been swept from the torrent bed into these caves of water, on which floated a green scum. The cleft through which this water passed, an outlying reef of granite, was hung with *Moringa* and *Capparis Spinosa*, the former being here called El Mai, not Yessar, as further north. The basaltic rocks in this ravine ring to the hammer like iron.

Back from Hamata and into the road we marched along the eastern flank of the igneous range over granite of varying coarseness and generally grey, but sometimes of green of different degrees of brightness. The hills of Hullus and the twin peaks of Hamamid appeared some 20 miles off over a sea of "cataract" rock, which, on the morning of March 13th, gave the camels some trouble before we climbed down into the valley of "beauty," the Wadi Jemal. Whether Jemal here means camels or beauty, must be left undecided; the fine Higlik and Murkh trees would support many camels, and a camel is the Arab synonym for beauty. An Arab widow mourns her husband with the cry of "Oh, my camel!" The Wadi Jemal is the largest and greenest of the coast valleys, and receives the main drainage of the hills from

* Abbadi, pl. Ababdi: for etymology and history, see *Journal Royal Asiatic Society*, Oct. 1892, "Mines of the Ethai."

† In the old geographers this mountain bears the Hamitic name of "Karkashenda," now completely disappeared.

Hullus in lat. $24^{\circ} 10'$ to Nugrus in lat. $24^{\circ} 50'$. Climbing down into it by a steep ravine we found here many ruined houses. Large walled enclosures had evidently held cattle. The Ptolemies used no camels, and the fact that they were close to the hills and partly carried away on the Wadi side, showed that great seyls or floods took place when they were built. It is curious that, with all the maps which had been examined



GORGE AT HAMATA.

before starting on this journey, we had yet no notion that we were close upon the houses and temples of perhaps the oldest and most extensive emerald mines in the world.* This in the Wadi Jemal was clearly an outstation where were kept the bullocks which served the

* These emerald mines were the only ones known until the conquest of Peru.
No. V.—MAY, 1893.]


caravans between the emerald mines and Berenice. The question now arose should we go to the wells of Abu Had, or visit more ruined houses in the Wadi Sikait; but in the latter word I recognised the "sekket bundare kebeer" of Cailliaud's map, which I at once took from my pocket. We left the Jemal and rode up the Wadi Sikait, and soon halted under a ruined building imposingly placed on a spur of rock, and opposite an apparently older temple carved in the rock in the northern flank of the ravine. Guided by Cailliaud's map we set out to find the mines. This was not difficult; after some 3 miles along the wadi, with ruined houses on either side, the mines began to appear like great rabbit burrows, and from each came a stream of silver-grey powder. When the valley turned to the left, under a high hill of mica and mica schist, there were paths and mines and streams of excavated stone. Again to the right were more mines. The mica was so plentiful that the hills felt underfoot like rotten wood. Some hills were of thin flakes



EMERALD MINES.

of sandstone set on edge, and looked like mountains of brown paper. Watch-towers and magazines were posted on prominent peaks, and well-pitched paths wound in every direction. Night overtook us wandering in pleased research, and we were glad that the forethought of Haji Mansur brought camels when he came to look for us weary with the weight of samples and camera. There was much to do here, but we were without water for a long stay. Moreover, to the south many geographical points had been left unexamined from our inability to climb the range from the seaward flank, so we moved back to the Jemal and up the Wadi Hafafit which skirts the Jebel Hafafit, a low range which, as the name indicates, you must "go round," and so to the large and bitter well of Abu Had, placed, like so many wells, on the very crest of the watershed. It appears that on the crest the rain collects between the impervious granite peaks, and is preserved from the sun by a covering of sand, but on either side of the watershed it runs down the slope and sinks too deep to be found by digging. Here I left the baggage with orders to go

south to a well called "Bir Khashab," of which we had heard; and, taking provisions for a week, I started with Haji Mansur down the long slope to the Wadi Jemal. Then up the Durunkat between two ranges, of which that on the seaward side was impassable, even for men on foot. We mounted rapidly, passed a well-built tomb of Sheikh Ali—an old villager of consequence—and halted at noon by a fissure in the granite, where was excellent water in a succession of rocky pools. Here are examples of a sandstone changing gradually into a granite, yellow first and gradually becoming green where near a vein of hornblende. One block may be seen which is a clear sandstone at one end, and a green granite at the other; it has even the "leprous patches" so common in the "cataract" rock which has been described. There were scattered huts in this well-treed valley, and the people had donkeys, goats and sheep.

The children wandered about with long crooks, and the sheep followed them about eagerly expecting the shower of leaves which were shaken from the acacias, and which formed their only food. These people are Asha'bab—i.e., dwellers in Shi'b, ravines, or creeks, and their wasm or camel brand is  the junction of two ravines. The Seyal trees are of the first importance to them; for, except these, there is nothing for their cattle to eat. Well-established old patriarchs with children to follow them preserve the trees most carefully, never cutting the branches, but serving themselves only with such leaves as are shaken off by the shepherds' long crooks. But a family who have usurped another's valley, or who are perhaps merely shepherds of sheep of some rich Nile-dweller, will cut down every branch and finally burn the trunks into charcoal.

When the Durunkat came to an end we crossed a small "divide" and dropped into the Wadi Jemal, here, in its upper portion, called the Wadi Hullus. Here was a good example of both styles of farming. The trees were merely mangled stumps; there seemed hardly a bough left for the sheep, mangy from starvation. But presently across the path was drawn a line, merely a scrape with the hand. This was the landmark between two families. Above this the leafy trees spread out in gracious verdure. Here was intelligent farming, fat donkeys, camels with swelling humps, and grave grey-bearded old men. These were Sheikhs Abdullah and Koraim, Haji Mansur's uncles. They had dwelt all their lives, as had their fathers before them, under the shadow of the mighty Hamata mountain. I spoke warmly in praise of their thrift in preserving their beautiful trees—even Haji Mansur might not cut for our camels. But the effect of my words was unfortunately undone. Later on we met "pillars" of locusts, and disaffected members of the caravan remembered with scorn my praise of Koraim's trees. This use of the word "pillars" of locusts is curious, and is perhaps drawn from the tall

sand "pillars," which are whirled about the desert in times of storm. Anyone who has watched one of these tall sand pillars rotating with inconceivable violence, advancing all the while slowly but irresistibly in a dead sultry silence, must admire the majestic thought which placed such a pillar as leader of the Israelites. The rocks here are scored with rude pictures of camels, ibex, men with bows and arrows, ostriches, and cows with crescent horns.

This evidence, independent of history, proves these animals to have lived here in former times. We left our camels in the valley at an altitude of 3500 feet, and proceeded to climb up the lofty porphyry peaks which closed in the eastern end. Here might be the caves of Æolus, and small gusts entangled in the narrow clefts make most violent efforts to escape. From the top was a grand view over mountain and valley, over coral island and wide blue sea. Immediately below us the cliff fell sheer 1000 feet, and steeply broken, twice as far again. From its foot the Wadi Kashir wound through rugged hills towards the plain. Haratreit and Lehema lay in the distant panorama, and the low Jezira range, ending in Ras Benas, indicated the situation of Berenice. This wall of porphyry was 6 miles broad, and the next day we turned in our tracks to the west and picked our way down the steep pass of Helgeit into an amphitheatre of hills, whence a long march over a stony slope led us to the low ridge in which lay the ancient masonry well of Helgeit, containing a reputedly inexhaustible supply of alum-tasting water. We were now in the catchment basin of the Khareit, and "Stonehenge," by which name any one will readily identify a cluster of worn granite rocks at the foot of the Mikbia' Pass, lay in the distance like an abandoned town. Down in the middle of the valley we climbed a hill. All around was a panorama of hills, delightful after the long wandering in the walled valley of Hullus, and all named by the guide, whom no surprises or cross-examining could shake in his nomenclature. The top of the "bodkin" appeared clearly over the horizon, and far away to the south rose the pinnacle of Hamrat Mukbud. Hamrat Mukbud, as seen from the heights over Abu Had, had been chosen as the right place to begin the plane-table survey, if, indeed, it should be possible to climb it, of which the guide spoke doubtfully. Abu Gurdi and the Bodkin were both fixed by the Admiralty, and with these Hamrat Mukbud formed a triangle, with sides of 32, 52, and 76 miles. The longitude of Hamrat was independently fixed by dead reckoning and by chronometer, and the latitude by repeated Polaris and south transiting stars. From Hamrat "Kullho Abbadi," "all is panorama," and a line of north and south peaks down the middle of the country, intersected by latitudes by polaris, would keep a map correct whatever might in the future happen to the chronometer longitudes. We moved up the northern flank of the Khareit, crossing many of its affluents and keeping the massive Abu Erghub on our right. We were for some miles just on the

dividing line between sandstone* and metamorphic rock, which swelled up in bare patches through the talus of boulders, which made the track bad going for the camels' feet. Jebel Khafa stands forth into the desert a bold mountain outpost, and between it and Abu Erghub on the main mass runs the Wadi Majsus, affluent of the Khareit. Here the march was slow, the road was so stony. We crossed the Um Daisha and then to the Wadi Sheikh Shadli, where stands the most important tomb, well, and intelligence station in the country. Close by here passes the main caravan route from Assuan to Suakin, and we approached the large stone building with much interest.

It was a pleasant solitude. The valley ran up into the hills, and the trees were not mutilated. The water in the shallow, slowly-filling well was sweet.

A young Sudani kept the tombs, three in number, placed in a walled yard. His little son was as thin, and as black, and as bright and active as can be imagined; and we left him running off to his mother to enquire what manner of thing might be a gold coin which we had placed in his tiny hand.

It was now six days since we had left our party, and it seemed a doubtful matter whether we might find them readily in this unknown wilderness. But, on entering the Wadi Khashab, there in the distance stood the well-worn camel-trunks in the shade of a rock under which we camped. Five or six wells here were dry, save one holding a little brackish water; but, as he had done at Abu Had, Haji Mansur fetched excellent water from a little distance. The rock here was a curious green "pistachio breccia," a green matrix enclosing light yellow blocks. It was a volcanic breccia. Hamrat Mukbud stands straight up 1600 feet from the level sandy basin of the Khareit. The centre pinnacle cannot be climbed, but the shoulders are high enough for observations, which are not without danger from sudden blasts of wind. Two nights were spent in taking latitudes, and the next station chosen was Jebel Mij'if, 40 miles to the north. Far away over the boundless sandstone plain to the south showed up the heads of Dagalawi and Na'aja. On the western horizon was the Jebel Suffra, and on the east the main range of Abu Gurdi, Safint, Hullus, and Hamata.

In the Wadi Khashab are many ruined villages, and the explanation of their presence appears to be in the topaz workings at Rizk Allah. The systematic workings of probably Ptolemaic miners have been obliterated by the persistent search of the modern Ababdi. They turn over the surface boulders, and scrape in the soil for what they may find; and I was told that the women on the Nile wore topazes from these hills. We wasted a day in the search. The hills that have been thus treated have a curious ploughed appearance, for the boulders on

* See Q. J. G. S. Nov. 1892.

the weathered side are all of an uniform brown colour, but where they have been overturned, the green side is exposed to view.

I left the party at Khashab with instructions to proceed to Mijif, taking on their way Sikait, where the artist was to photograph some inscriptions which he had detected only just as we were riding away. I rode rapidly down to the Nile to get fresh time data from the temple of Kom Ombos. It turned out afterwards that the longitude of Kom Ombos is one of the places on the Nile for which the authority is lost. Nouet, whose observations are given in the *Decade*, a scientific paper published in Egypt during the French occupation, is followed closely for all Nile longitudes north and south of Kom Ombos. But Nouet places Kom Ombos 14 miles to the west of its position on modern maps. The authority for its present position I have not yet found, but this, the only departure from Nouet, demands investigation.

We rode due west through low hills of vertical laminated slate. These were covered with long strips and shreds which made them resemble hills of black "tibbin" or chopped straw. Then came "cataract" granite which changed to a reddish syenite, and the first night's camp was on the line where this disappeared under the sandstone. We crossed the Antar and its affluents, all draining into the Khareit. Then we entered the Wadi Muktil between two round hills of sandstone over blue clay, and this led us into the broad Wadi Natash which runs between sandstone cliffs, from 100 to 250 feet high, under which showed blue clay. Natash is the Arabic for *Crotalaria Aegyptiaca*, but this plant is not now more found in this Wadi than ostriches are found in the Wadi Na'am or "Ostrich" Valley. But the Wadi is interesting geologically. It appears that the water has percolated through the blue clay, and thus undermined the sandstone which falls in huge boulders from the cliff on either side.

"Haguban," plural of Hugab, boulders, is a useful word, and generally indicates a shady nook to sit under. Many boulders are hanging from the cliffs, some as large as railway waggons, ready to thunder down. The soft smooth surfaces are scored everywhere by crude drawings of horses, cows, bowmen, troops of ostriches, ibex, camels, and men. The sandstone range through which we are passing sinks gradually to the west, and the blue clay disappears below the bed of the Wadi.

We left Bir Khashab on the morning of April 3rd; by noon on the 5th we had reached the absolutely flat desert. In the evening we camped due west of the Nasab Nugra, a pyramidal bluff of sandstone, which forms the landmark which guides all caravans coming over the flat plain, which reaches from here to Kom Ombos. All the next day we rode over this dreary plain of light, friable sandy mud. During the whole march the aneroid only altered from 260 feet in the morning to 120 in the evening. Here we were in the bed of the Khareit, and near its junction with the Allowi, the source of which we had seen when

leaving Assuan. Due west is a slight rise in the plain, which curves the Khareit to the north. On the morning of the 7th we rode into the Nile Valley at Darawi, the aneroid coming steadily down to 10 feet at the river bank. Here is a wonderful great plain, surely more worthy than Luxor to be the site of a great city. Was it, perhaps, too near the ferocious Blemmyes for people here to lay out wealth in irrigation?

After an evening spent at Rakaba, in telegraph communication with chronometers at Cairo, in observation of the stars, we left again the next morning and steered a north-east course over this great plain, aiming for the confluence of the Khor Shaid with the Khareit. This we reached the first evening, riding over a plain of good soil, with occasional banks of pebbles. About 14 miles to the west a sandstone range ran north-west and south-east, perhaps 600 feet high. The Shaid cuts through the sandstone plateau just as the Natash does. We rode up this fairly shrubby valley till noon on the 10th, when we took the Wadi Sibrit, which cut off a large bend, and brought us to a well of sweetish water said to be never dry. The water was 14 feet from the surface in sandy earth. Having watered the camels at the Sibrit well, we pushed on to the gold mines of Hamesh, near the confluence of the Hamesh and the Shaid. Here was a large station, and the thick vertical quartz reefs had been worked to apparently great depth; but without ladders it was impossible to go very deep into them. The quartz lies about the mouth of the shafts in measured heaps. It is very brittle and generally of a rusty colour. This must have been a pleasant station in the winter. The trees in the valley average some sixty or seventy to the mile, and the ground was covered with basilla and other shrubs. The shepherds here brought water from the Sibrit well. The old sheikh grumbled at bad times, no rain, mange among his sheep. But it seemed to us that he spoke more in dread of exaction than in suffering from loss.

Riding to the north the country opened out at 1100 feet, and shallow wadies converged from all points to make the Hamesh. Here is the laminated clay—a broad belt, for the dip west is very slight; and, though the clay be only perhaps 300 or 400 feet thick (we did not see the bottom of the bed—under the cliffs of Natash it was nearly horizontal), still the angle with the horizon is so small that it spreads out over a breadth of 3 or 4 miles. On the 13th, ten days after leaving them, we rejoined our party camped at the mouth of a ravine, a branch of which contained the deep well of Mij'if. Riding up over the vast sloping plain, we saw the unaccustomed luxury of a tent. This had been sent me by my good friend Herbert Pretyman. He had just returned to Kina from an ibex shooting expedition in the Kittar Mountains to the north, and his was the kind thought to send me his tent. He died but a short time afterwards, regretted by literally every one who knew him.

Home is home if it is only a box full of dictionaries and tinned provisions—which is practically what it was, now plus an excellent tent. The artist, however, had fallen ill, nor had he been able to photograph the Sikait inscriptions; and he returned to Cairo as soon as the letters were ready for the post.

The well of Mij'if has a narrow mouth coped with large boulders, and is some 26 feet deep. It fills slowly, and we were unexpectedly delayed at starting by a party having drawn all the water just before we sent to secure our supply. The plane-table here gave us few rays to the east, the view being blocked by the mass of Jebel Nugrus. But the next peak to the north was an excellent landmark, a granite bost some 1200 feet high called Abu Diab. Mij'if is on the crest; as described by Haji Mansur before we reached it, "Mij'if in the morning throws its shadow to the west, and in the evening to the east of the watershed." We planned on leaving here to go first seawards, and then south to the emerald mines, and a rough road we found it. But first we visited a Roman Caravanseraï 5 miles to the south, identified by Colston as the *Aristonis* of the itinerary. It lay close by the Dueik, which falls into the Shaid, and differed from the massive forts to the south in being of slighter construction. Outside the square enclosure, containing rooms and a cistern, stood a smaller building. It was Euclid who told Ptolemy that there was "no royal road to learning;" and the reference was to the roads along which were post-houses with their relays of fresh animals, as distinct from caravanserais, where the original caravan rested and went slowly on its way refreshed. The road was the same, except where a mounted man might save distance by a path impassable to loaded animals.

On the 18th we left the camp, reduced now to a couple of trunks and a tent, and rode north across the sources of the Mueilleh. Within a mile of this west-flowing Wadi are the "tails" of the east-flowing Um Khareiga. Then we rode south, across many affluents of the Ghadir, a Phœnician name, identical with Cadiz and meaning "enclosure" or "pool." This, when joined by the Abiadh and the Zabbara, becomes a fine, well-treed shingle stream.

On the morning of April 19th we entered a curious formation of green micaceous slate. To the south rose some 1200 feet, the mass of Jebel Zabbara, and here we camped amongst the old stone houses of the Albanian miners employed under M. Caillaud in 1819. It was a curious and picturesque place with many good trees and sheep feeding. From under the black bluff of Zabbara ran two long spurs, or banks, of green mica schist, quartz, and limestone in complicated tortuous bedding. In these banks were the principal shafts; and, under the mouths, the valley was cumbered with mounds of shining silvery ore.

The Albanians were worse house-builders than the Romans, but

they were better miners. The ellipse-shaped stone houses here were rude compared with the villas and barracks at Sikait. But the rabbit burrows there were replaced here by square straight shafts, with ventilation; one of these we now prepared, with some misgivings, to descend. At 10-foot intervals were wedged across the shaft stout boughs of trees. A steep slope at first, and then a drop, then a further slope. My Egyptian servant, Byumi, went down first, and took out in all 430 feet of string. Here, neatly placed in a row on a low chamber, were baskets of ore, one of which was with difficulty brought to the surface. It was curious to note the Egyptian promptness to go down a mine. The Arab could hardly be got inside to hold the end of the string and a lamp. The Englishman was vaguely afraid of "treading on something," and descended only under a sense of duty. But the Egyptian climbed down full of glee, and when he got to the end of the string he tied it carefully to a rock and went on without string.

At the end of the ravine was a gale where Haji Mansur said he would go and shoot an ibex, which he did; it was afterwards cooked and eaten, to the complete prostration of the party on the morrow. It is worth knowing that ibex are not safe eating where there is artemisia in the valleys. My botanical knowledge saved me, but I had a dejected following when we started over the stony slopes to climb round the south-eastern corner of Zabbara. It was a long day's march and included some steep work for the camels. The mass of Zabbara is, I think, the blue clay tilted up by the igneous up-thrust, which probably supplied the heat which metamorphosed the sandstone. The question of the relative age of these rocks has been discussed elsewhere. Interesting indications were observed that the sandstone plain extended across the ridge, while masses of it are caught, as it were, between the higher peaks. The quantity of mica is prodigious. At the foot of the eastern flank is seen the grey "cataract" granite which underlies the blue clay. We climbed over the blue micaceous ridges, honeycombed everywhere by mines, and dropped into the Sikait Valley and slept that evening on our former camp. It was disappointing to find no vestige of inscription in the built temple, or perhaps church. Those over the rock-cut temples were copied, but alas, we were some five hundred years too late. The soft friable sandstone, in which the Greek was cut, had worn away.

The Rev. Canon Wright, of Coningsby, translated what could be deciphered as a dedication to Isis, Apollo, and all the gods. A reference to *ἰβυρας*, ibex, and *βερενικης* was unintelligible.

We left by a route up the valley, and, turning west under the principal mines, we clambered down into the Nugrus Valley and marched north-west between the Nugrus and Hafafit ranges. Thus we had four routes to the Sikait mines, but yet we did not know the route between them and the sea. Here interesting matter might be found either by the Wadi Jemal, or by the Wadi Ghadir route. The

Nugrus and Hafafit ranges nearly meet at the north, and only a narrow torrent bed divides them. On this march the stratification was very clear—the metamorphic over clay or slate, and clay over grey “cataract” granite.

From our old camp at Mijif we started west and passed between some huge bosses of coarse, whitish granite, in which felspar predominated largely. These start sheer out of the level plain and are called “Mudarghag.” Thence we travelled north over a level plain, or “Rotha,” and camped in the “tail” of the great Wadi Beza which springs from the Jebel Abu Diab, a fine plane-table station. From here we marched 8 miles west down the Wadi Beza to the post-house of Feisoli, a somewhat Roman-sounding name. Thence we crossed a low range which, though insignificant, formed the dividing line between the drainage-basins of the Khareit and the Abbad, which latter reaches the Nile opposite Edfu. A violent burning wind scorched us up this 26th of April, and, indeed, for the ensuing month we suffered a great deal from the heat. Not only in person, but in surveying work also; for the sun and stars by night, and often the whole prospect by day were obscured by haze, delaying observations. Three miles west of Feisoli, but in the Abbad basin, is the large Caravanserai of Abu Geraia. We were now on the route of Colston, who identifies this station as Compasi.* Here amongst the vertical clays and shales were pockets of limestone, advantage of which had been taken by the Romans to cement the huge tanks built of good burnt-brick masonry.

From Abu Geraia (the second of the name) we crossed low sandstone hills into the Wadi Miah, a broad and deep affluent of the Abbad, and followed it up to the gold mines of Sighdit, in the Wadi of that name, which is a small branch of the Mia. Haji Mansur derived Mia from Ma, water, but was corrected by a resident who derived it from El Mai, a southern synonym of “Yessar,” the *Moringa Aptera*. There were in the valley neither water nor Mai trees. The mines of Sighdit are close to the Hedlawi hills, which merit some description. They are low regular mounds, some three to five hundred feet high, of what Mr. Henson calls volcanic breccia. They present much the appearance of a soft, brown cushion with deep depressions formed by tightly sewn buttons. They might be called “mammillated.” Here, as in Arabia, they are called “Ginna,” and they suggest that an area of sand-hills had been fused into rock.

The Sighdit wells, reputed inexhaustible, contain excellent water, the best we had drunk since leaving the Nile. The water is held up in the valley probably by a dyke of rock under the present bed. Sand-

* A station called Sarbut was spoken of as one day's journey to the west of Abu Geraya. There is also a Sarbut (? Sarmount) Kadim in the Sinai peninsula. Capt. Godby, a.e., writes from Akaba that “sarbut” means an “outlier” or “temofu.”

grouse and partridges came in great numbers to drink. The *Amnoperdix heysii*, with a tuft of white feathers over each ear, in the male only, was here common. Blue pigeons were as tame as at the well of Abu Had. Over the well in the face of the rock is a hieroglyphic inscription, merely scratched on the surface, recording the visit of a royal scribe and of a superintendent of the mines. Hither from the East came, during our stay, Sheikh Said with some twenty young camels bursting with fat, which he was to sell in the "Rif," the universal name for the Nile Valley,* and a caravan of wheat arriving from Kos at the same time, the place assumed a busy air. Sheikh Said was willing to give any information in his power, but he had a way all his own of baffling his enquirer. He would listen with great earnestness to my questions, regarding me all the while as if he was studying a wild animal. Then he would pause, seize me by the arm, and in a voice of deep emphasis ask me a question. His fat camels had been in a valley where rain had fallen, and had found sweet "gash" or short grass, that which is so much more fattening than any shrubs. Sighdit is a good example of two mining periods. For a mile along the valley by the wells are hundreds of little stone huts; they differ from the modern stone huts now built by the settled Ababdi in this particular. The ancient walls are two defined faces of large stones with the intervening space filled by pebbles. A modern wall has but one line of stones; it is, so to speak, a one-stone wall, and the interstices are filled with mud, old rags, mats, etc. This at Sighdit was an ancient settlement, though the mines in which they may have worked were not found. Three miles away from the wells are the extensive ruins of a Roman settlement. Here the quartz veins have been largely worked. There is much to show that the Ptolemaic miners established themselves wherever they found the Troglodytes had been working and there results from the geological study of the country little doubt that the Troglodytes of Herodotus were "miners" not cave-dwellers.

Our two caravans departed, one east, and one west. We left for the south in search of a, so far as we could find, non-existent Jebel Rusas or mountain of lead. Something there was, however, which upset the compass in this neighbourhood; it was sometimes deflected 40° to the west.

We rode round the south of Um Nagad (a plane-table station), over a broken plain, through which uprose blocks of "cataract" granite, and, falling into the Wadi Bararig, we rode down between its oven-hot walls, 60 yards apart and 50 yards high. Um Nagad was a cluster of "bosses" of pink felspar without mica, and the coarse felspar sand streamed down from its sides like pink snow. Some attempt we made

* "Rif" means "cultivated land." The term in Northern Africa has been thought of as originating the English word "ruffians."

to identify the "crimson mountain" of ancient geographers. The difficulty lies in the number of hills to which the preponderance of coarse, deep pink felspar gives the "crimson" qualification. Few words have changed more than the meanings of colour names. The ancient porphyry is not purple nor was the Roman's crimson the colour of a modern soldier's coat.

We were now approaching a mass of hills which bore the curious name of Kodaboro. This name, so proper to the Sudan, appears most unsemitic.* This is one of the names that suggest that the Troglodytes, the pre-Ptolemaic miners, were the Negroid iron-workers who now work minerals in the hills to the south of Kordofan, a race of great character, who gave kings to Darfur. Kodaboro sent a stream of bright pink sand into our Wadi Bararig, and here was a rare thing, a stream of running water, brackish and flowing through tall rushes. It was not unpleasant to the taste, and our camels drank it freely. Nor was there other water for the Ababdi, whom we passed on the road. With them was a man from Kosair, astonished beyond measure to see an Englishman. He solemnly ejaculated "la illahi ill' allah" with such disjointed deliberation that none of the party could contain their laughter.

At noon on May 4th we were at the confluence of the three Wadies: the Bararig, down which we had ridden; Imbarak, whose "tail" was at Abu Diab, opposite Beza; and Kodaboro. The valley was in places 600 yards broad, and the little geological sketches of the hills inserted on the sketch-map look as if they were drawn with a comb, so regular are the wavy lines of the vertical laminated slate.

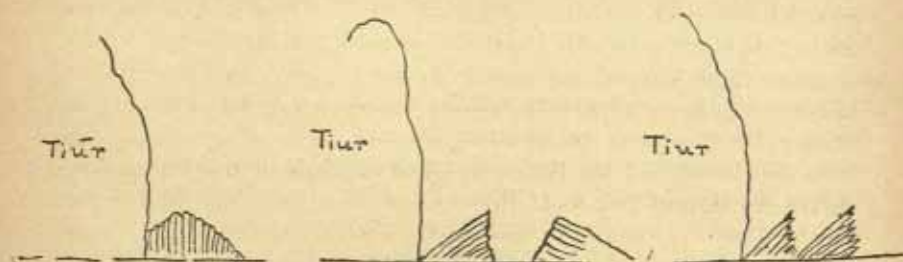
Here were houses, increasing in number as we advanced. Further on a ruined town 400 yards long by 100 yards broad, mining shafts, paths about the hills, and heaps of quartz-pounding pestles. We were near the sea, and the damp air was unwelcome, seeming to unstring the frame. Presently the great Imbarak debouched on to a limestone plain, the valley walls of black slate seeming to sink under the shingly surface. Here we turned sharp round to the north and entered a creek in the hills, and in a short time the camels knelt at Um Rus.

A broad quartz vein traversed the eastern cliff, and in this a shaft had been sunk. In this mine lay the water. Wonderingly we crept in, and the flickering candle showed a broad flat cavern, just the height of the quartz vein's thickness. Down the steep slope we scrambled more than 100 feet, and there lay a pool, so still and transparently clear that I put my foot in it before I saw the water. Round the edge lay huge sea-shells, used by the fishermen to fill their water-skins. The water was sweet, and perhaps its reputation of causing the consumer to swell was given it to prevent its too free use. Next day, following up

* *Conf.* the Hamitic "Kudab ero," "many children," and the "Banāl Mukbud," "daughters of Mukbud," name of the mass of hills round the Mukbud Peak.

the ravine, we mounted a dry waterfall, and found an incredible number of small shafts, stone huts, and quartz burrows. They reached back to opposite the Roman station we had seen. Here again were the evidences of two mining epochs, just as at Sighdit.

In computing the number of people who may have occupied these villages, it is probably right to consider all the huts to have been occupied at the same time. With many Oriental towns this is not the case. At Isfahan, for instance, there is always—speaking from memory—half the town deserted. Were Isfahan destroyed, and its people counted by houses, the estimate would be double the truth. But a miner would hardly build two houses, and there may well have been two thousand of the pre-Ptolemaic miners here. In the following afternoon we rode down to where the Imbarak entered the sea. We were in search of the Ptolemaic port *νεχέσια*. The stony slope is here so difficult for the camel's feet that progress could only be along the devious paths; so we went the way the path took us, and reached the flat unsmiling sea in the evening. Nothing was found that could



suggest an ancient port. But the moving sand along the coast covers everything, as at Berenice. The stony slope between the hills and the sea is, in this latitude, cruel work for the camels.

Covered with sharp blocks and scored with steep ravines it is difficult to go anywhere but up or down a wadi. However, we struck across and reached the Wadi Mukeyaj. Presently we entered the hills. Abu Tiur, where our camp was waiting for us, was always visible, a fine landmark seen at sea from a distance of 70 miles. But once in the hills we puzzled about a great deal before we could find a valley which led there, so difficult is it, on the eastern flank of the hills where the valleys are deeply scored, to go anywhere but where the wadies lead. Abu Tiur and the Saba'i hills stand up among their vertical schist surroundings tall bosses of buff-coloured live granite. A section near Abu Tiur is curious, the dip of the slate looking as if that mountain had dropped from above instead of risen from below.

A gaunt camel grazing by the way glared at us with deepest malignity. It was he who carried the heavy provision boxes, so their arrival was assured. We were now near Kosair, and near the well which supplied

Kosair with from one hundred to one hundred and fifty camel loads of water per day. Hendosa is the name of the well, a name also of a rounded granite rock near Um Eleigha.

The water is collected in a narrow ravine, and ponded under the sand by dykes of green hornblende.

During most of the night some five hundred water-skins are filled and laid on their backs in rows, like fat black pigs. No tap or syphon is used, but there is a tin "dipper" and a broad-mouthed tin funnel black with grease. It seemed right to admit 2 cubic feet of water per skin and estimate the daily yield of water at 14 tons, or 3000 gallons. The Hendosa wells are in the side of a great depression in the coast-line. In the centre of the depression is limestone over sandstone. Here runs the Khor Ambagi, of which the water is salt, and in the great Wadi Dibba' are tamarisk bushes, the sure accompaniment of limestone. Kosair, the λευκος δῆμον or white port, may have been an arm of the sea, like the Wadi Araba, but shorter and broader. It was pleasant to arrive at the civilised port of Kosair, fix the plane-table for the last time, and dine with the excellent governor. The road from Kosair to Kos is well known; indeed, it is now marked out in kilometres with red paint by Mr. Nicour, engineer-in-chief of the State railways in Egypt, and may some day have a train thundering through its narrow gorges of varied breccia and metamorphic rock.

In conclusion, the geographical results of this expedition are set forth in the map given on p. 480, and but little need be added to the concise legend. The surveys extend over 23,000 square miles of mountainous desert traversed by a ridge, the higher peaks of which shelter a few poorly-nourished shepherds, and the new map joins on the south the country described in the *Proceedings* of this Society for November, 1887.

The interest in the country is more geological and antiquarian than geographical. The numerous mines have been worked from the beginning of history, and by methods which were described two thousand years ago as of "the greatest antiquity." But geographically the country may be summed up in the following words:—

The broad sandstone plain slopes gently upwards from the Nile to a ridge running north-west and south-east, and varying from 2000 to 7000 feet in height, and to the east of the watershed slopes more steeply down to the sea. The valleys in and near the foot of the hills contain a fairly thick growth of acacias, on which sheep are fed. The water-supply is principally in natural reservoirs of rain-water. The principal feature is the mountain mass, under which lay the town of Berenice. These mountains, which run up to 7000 feet, are of porphyry and compact granite, and show signs of recent volcanic activity.

Ibex are numerous, the wild ass is still found, and the last ostrich

was ridden down not more than twenty years ago; but the camel will soon be undisputed lord of all the deserts. Here is clearly marked the footstep of the camel in his migration westward from Asia. History even allows us to fix the date when it was planted here. And the intimate connection which exists among his pastoral masters, between botany and geography, enables us to estimate the effect of the camel's arrival here.

THE ORTHOGRAPHY OF GEOGRAPHICAL NAMES.*

By Lieut.-Colonel J. C. DALTON, R.A.

To all who are interested in the vexed question of the orthography and pronunciation of geographical names, this interesting contribution will be welcome. The subject is one which is perhaps not so freely taken up as its importance to geographers and cartographers deserves, and we must be all the more grateful to those who, like Dr. Köppen, have devoted their attention to it, and who give to the geographical student the benefit of their knowledge and study in this direction. The pamphlet under review consists of some thirty-nine pages of closely-printed matter, and is in fact a paper laid before the German "Geographentag" (April 1893) by the author.

Though a complete translation would be very interesting, I have limited myself to a fairly full *précis*, owing to the imperative necessity for economising space.

The author divides his article into five main headings, which I propose to give in succession with as much brevity as I feel justified in using:—

1. *The development of the question since 1885.*—After pointing out the inconvenience of having several ways of writing geographical names, the author assigns the credit to the Royal Geographical Society of London and the British Admiralty for having, in 1885, been the first to attempt to grapple with the question, remarking that the English system of considering the "vowels as in Italian and the consonants as in English" is nearly identical with the principle followed in 1876 by the German Eastern Asiatic Company, who, on their part, had taken their ideas from 'Hepburn's Japanese-English Dictionary.'

In April, 1886, the Paris Geographical Society followed with rules which in many points agreed with the English, but which, unfortunately, have not found much support amongst French writers. However, in June, 1887, the French Admiralty accepted this system, and in 1888 the German Hydrographical Department published similar rules. The German "Geographentag" entered this subject on the programme for their meeting in Berlin in 1889, but hardly touched on it. Though not ripe for discussion at the Berne Congress in 1891, it is hoped that it will be considered at the next assembly of this international Congress.

* "Die Schreibung Geographischer Namen: Vorschlag an den Deutschen Geographentag von 1893." Von Professor Dr. W. Köppen. Hamburg 1893.

In the autumn of 1890 the Government of the United States assembled a "Board on Geographic Names,"* which consulted all the different foreign hydrographic departments, and published their answers in a voluminous report, dated October 7th, 1890. Dr. Köppen, in briefly criticising this system, agrees that, so far as the vowels are concerned, there can be no doubt that the (practically identical) German and Italian mode of writing them possesses the greatest advantages. But as regards the consonants it is otherwise; the dialectic differences in German are very great, and also through the absence of signs for the "soft" *s* and *sch* (French *z* and *j*), through the superfluity of two signs for the same sound in *f* (*v*) and *z* (*c*) (which latter, moreover, because it = *ts*, is really superfluous), and on account of the monstrous *sch*, the German consonant system is at a great disadvantage as compared with the French and English.

Through the above-mentioned decisions of the various hydrographical departments, official recognition has been obtained of a system analogous to that which certain prominent German geographers adopted some score or so years since. The author only regrets that in these later rules the principles followed by H. Kiepert in the fifties, and Von Richthofen in the seventies, have not been more fully made use of.

Kiepert's rules were, briefly, to employ the German vowel sounds *ä*, *ö*, *ü*, the English *y* for *j*, *v* for *w*, *kh* for *ch*, *s* for the sharp *s* (*sz*), *z* for a soft German *s*, *sh* for *sch*. Corresponding to the latter, *tsh* was written for the German *tsh* (English *ch*). A *j* denoted the French sound of this letter (soft *sch*). He objected to the English *zh*. Von Richthofen, in his work on China, also laid down rules for spelling the Chinese words.

The author gives a table which shows the decided similarity between the above systems and those more recent of London, Paris, and Berlin. He laments that the official systems are based on so slight a regard for the doctrine of sound and are so often wanting in clearness in their definitions; also the many different senses in which they use the words "hard" and "soft." Under these circumstances misunderstandings are unavoidable, and are even fostered by these systems.

He next investigates scientifically the various sounds as pronounced in different countries and in certain parts of Germany, and then formulates his proposals for an international (German, English, French) system of orthography for geographical names.

He bases his rules on the undermentioned principles or axioms:

A. That we admit without further alteration everything which is common to the three already-accepted systems of London, Paris, and Berlin.

B. That where the above three systems disagree we can, by disregarding the tendency in which they are formed, choose the best existing, which will ensure the utmost simplicity, economy, symmetry, and intelligibility. Thereby we shall preferably hold to the above-mentioned proposals of Kiepert and Von Richthofen.

C. That in some cases, which the above three systems have still left in doubt, we shall endeavour to amplify them in the same spirit.

The author then lays down rules under the above three headings, A, B, C.

A.—THAT WHICH IS ALREADY AGREED ON AND TO BE ACCEPTED.

Rule 1.—Names of countries (states and nations) in which Roman characters are officially used shall be written in the form in which they appear in the latest official publications (maps, books, &c.) of these states.

* The United States of America virtually accepted the system of the R.G.S. *en bloc*.

N.B.—This applies equally to the old Roman character and the alphabets derived from it, the German Gothic character, the Spanish *n*, &c. As regards colonies, "the orthography of a name in a territory belonging to a civilised power and given in their maps is only followed with respect to their own names and not to native names," which are transcribed according to sound. It is therefore all the more desirable that in the case of colonies and protectorates recently acquired, say, since 1880, the principle laid down in Rule 3 should be followed.

Rule 2.—For names the orthography and pronunciation of which (in German, French, and English) is of long standing, such rendering shall be maintained in national publications without regard to the rendering which may be in force in the country itself. For example, in England we should still speak of Copenhagen, Brussels, Cologne, &c., and not of Kjøbenhavn, Bruxelles, Köln, &c. In publications bearing an international character such forms naturally fall to the ground.

Rule 3.—For all remaining names the true sound as used in the place itself, or in the official language of the state concerned, will determine the mode of orthography.

Rule 4.—An approximation, however, to the sound is all that can be aimed at, and not any exact representation of the minor shades of difference which would involve a far too complicated system of signs.

N.B.—We may define the limits of exactness to be such as would sufficiently express the sound by means which exist in European languages.

Uniformity may be attained by understanding the sound-value of the following letters :—

<i>a, e, i, o, u</i> , pronounced as in German or Italian.			
<i>b, d, f, k, l, m, n, p, r, t</i> ,	"	"	French, or English.
<i>g</i>	"	"	as <i>g</i> before <i>a</i> and <i>u</i> in French and English.
<i>u</i>	"	"	as in French and English.
<i>y</i>	"	"	as <i>j</i> a consonant, like the German <i>j</i> .
<i>sh</i>	"	"	as in English (= German <i>sch</i> , French <i>ch</i> , Italian <i>sc</i>).
<i>kh</i>	"	"	like the German and Scotch <i>ch</i> , Greek <i>χ</i> , Spanish <i>j</i> and <i>x</i> .
<i>gh</i>	"	"	like the modern Greek <i>γ</i> , Dutch <i>g</i> , or North German <i>g</i> in "Lage."
<i>ph</i> is not to be used in the sense of <i>f</i> .			
<i>h</i> , except where it is used to alter the pronunciation of a preceding consonant, will always be pronounced as in German and English; mute or aspirated <i>h</i> will not be used.			

B.—AS TO THOSE POINTS WHERE THE THREE SYSTEMS DISAGREE AND WHICH REQUIRE TO BE DECIDED, WE MUST TRY AND FIND THE BEST SOLUTION.

Rule 5.—In every case where it appears desirable, a second rendering of the name may be placed in brackets; thus all which bears on traditional orthography can be in large characters, and the exact phonetic rendering can be smaller. Thus, for example Kiyef (Kiew), Chiati (Kiéti), Ceuta (thé-uta).

N.B.—As regards Rule 2, a similar course can be adopted if necessary. Ex. Milano (Milan), (Ger. Mailand).

Also with Russian names ending in *ov* and *ev* the rendering might be, for example, Tambôf (Tambou), Nikalâyefsk (Nikolaevsk).

Rule 6.—All compound-sounds, such as x, the German z and c, the English j and ch, shall be separated into their constituent parts.

N.B.—The association of sounds varies greatly in different languages; thus the combination *ts*, frequent in German, Russian, and Chinese, is not found in English and French. *Tsh* (German *tsch*) is frequent in English, Italian, and Russian, but rare in German and French. The symbols selected in different languages to denote these sounds vary. The common English compound sound *j* and Italian *gi* are wanting in French and Russian, although their constituents exist.

[The author here analyzes and tabulates the various sounds as they can be rendered by European tongues, specifying by figures those sounds which cannot be so rendered, and showing how the three (English, French, and German) systems of orthography provide for them. He shows that the English provide for seven, the French for five out of these seven, and the German only for one which is not provided for by the English or French.]

To fill the gaps he proposes his

Rule 7.—Diacritical signs attached to letters are to be avoided, and only can be permitted (a) when sanctioned by many years usage in an important literature (Ex. ù and ü in German); (b) when, without them, the pronunciation would be not only less exact, but unrecognisable.

Rule 8.—In the case of names spelt according to sound, each letter must be distinctly pronounced, with the exception that two different vowels coming together may form a diphthong, and amongst consonants a few simple sounds will be represented by pairs of letters.

N.B.—This rule corresponds to Rule 7 of the British system, in which, however, the consonants with *h* and the *ng* are omitted. Rules 1 to 4 correspond to the similar numbers in the British scheme. To complete the omissions in the three schemes, the author proposes a *th*, *dh*, *zh*, *ng* (as in "Lunge"), *û*, and *ô*.

As regards accents, the English and German systems only admit one acute accent "where there is a very decided emphatic syllable which affects the sound of the word." The French do not mention such, but use a circumflex accent to lengthen a vowel. Doubling a vowel is not admitted except in special cases such as "Nuulus." To shorten a vowel the English system doubles the consonant which follows it, but the Germans do not legislate for either lengthening or shortening vowels. The German hydrographical rules use *â* and *ä* to denote the open *e* and *o*.

Rule 9.—A grave accent should denote an accented open vowel, an acute accent an accented closed vowel, and a circumflex a vowel pronounced long (accented more or less), also a doubling of the consonant following a vowel will denote a pronounced short vowel; should there be any doubt as to the accent, then the vowel should be left unaccented.

Examples of "wide" vowels are those as in *Tisch*, *Tusch*—to be written with *î* and *û* if the accent is on them.

C.—POINTS LEFT UNTOUCHED IN THE THREE SYSTEMS.

(1) For the sound of the Russian *и* (Polish *y*, Roumanian *î* and *â*) he recommends the symbol *î*.

(2) For the nasal vowels (French sound *an*, *on*, *in*, *un*) he proposes the Portuguese equivalents *ã*, *õ*, *ê*, *ô*.

(3) Palatal consonants: In order to obtain the *j* (*y*) sound, which in certain lan-

guages appear between a consonant and the vowel following in such words as *Rjasan*, *Dnjestr*, he introduces a *y*, and legislates for it as follows in

Rule 10.—A *y* after a consonant is to be pronounced as if dissolved with it, and serves as an index of the palatal sound of the consonant. This is, however, indispensable before *a*, *o*, *u*, and *è*; in other cases it would be used when by so doing it would simplify the case.

N.B.—This rule would mainly be used for transcribing Russian words.

A few examples out of those cited by the author will show how this rule would be applied.

French.—Gascogne (gaskòny), Bretagne (brütány).

Italian.—Bologna (bolònnya), Legnago (lenyágo).

Portuguese.—Minho = Spanish Miño (míno).

Russian.—Ryazán (ryazány), Tvér (tyvéry), Khárkof (kháryk'f).

Rule 11.—When two letters, which denote, when joined together, a diphthong or a simple consonant sound, are pronounced separately, they should be joined together with a hyphen (-). Example, *Da-urien*.

The author by means of a table compares the proposed international geographical alphabet with the "standard alphabet" of Lepsius and that described in the 'Maitre Phonétique,' by P. Passy, with which it generally agrees.

The international alphabet as proposed by the author is as follows:—

<i>p</i>		<i>t</i>		<i>k</i>
<i>b</i>		<i>d</i>		<i>g</i>
<i>f</i>	<i>th</i>	<i>s</i>	<i>sh</i>	<i>kh</i>
<i>v</i>	<i>dh</i>	<i>z</i>	<i>zh (j)</i>	<i>gh</i>
<i>m</i>		<i>n</i>		<i>ng</i>
<i>w</i>	<i>y</i>	<i>r</i>	<i>l</i>	<i>h</i>
<i>u</i>	<i>ó</i>	<i>ü</i>	<i>ï</i>	<i>i</i>
	<i>ö</i>	<i>ö</i>	<i>ä</i>	
	<i>ò</i>	<i>ö</i>	<i>è</i>	
		<i>a</i>		
	<i>ä</i>	<i>ε</i>	<i>ö</i>	<i>ö</i>
<i>ky</i>	<i>gy</i>	<i>ny</i>	<i>ly</i>	<i>khy (χ)</i>
<i>ä</i>	<i>ê</i>	<i>i</i>	<i>ô</i>	<i>û</i>

Having now arrived at the international alphabet, the production of which was aimed at, the author proposes the 12th and last rule.

Rule 12.—For purposes of transcription, speaking generally, it is necessary that each sound shall be expressed by the letter which most closely represents it, without regard to grammar, derivation of words, and the traditional orthography in the language immediately concerned.

The above paper was completed in May 1892 and laid before the committee appointed by the German Kolonialrath to draw up a system for the pronunciation and orthography of geographical names in the German protectorates, which resulted in the rules (approved and adopted by the German Government) to which attention was drawn in the *Proceedings R.G.S.* of November, 1892.

The orthography as then adopted would, if arranged in a table similar to that given above (proposed by Dr. Köppen), be as follows—

<i>p</i>		<i>t</i>		<i>k</i>
<i>b</i>		<i>d</i>		<i>g</i>
<i>f</i>	—	<i>ā</i>	<i>sh</i>	<i>kh</i>
<i>v</i>	—	<i>f</i>	<i>j</i>	<i>gh</i>
<i>m</i>		<i>n</i>		—
<i>w</i>	<i>y</i>	<i>r</i>	<i>l</i>	<i>h</i>
<i>u</i>	<i>ü</i>	—	<i>i</i>	
	<i>o</i>	<i>ö</i>	<i>e</i>	
	<i>o</i>	<i>ö</i>	<i>ä</i>	
		<i>a</i>		
—	—	—	—	—
<i>ā</i>	<i>ē</i>	<i>ī</i>	<i>ō</i>	<i>û</i>

Dr. Köppen claims that a glance at the two tables will show that in most cases the committee agreed with his proposals; and he indicates and criticises those points as to which the committee did not accept his views (these are shown by the blanks in the latter of the two tables).

In a footnote, p. 35, Dr. Köppen alludes to the *Proceedings* R.G.S. of November last, wherein I reviewed the new German rules and compared them with those brought out in 1885 by the R.G.S. (and revised in 1892).

Though I cannot but feel honoured that my few humble criticisms of the points of difference between the English and German systems should have been deemed worthy of the attention of so distinguished an authority as Professor Köppen, I regret that they have left such a poor impression on him as his remarks in the above-mentioned footnote would seem to imply.

Still, may it not be possible that we are considering the subject of orthography of geographical names from different standpoints? The English system as drawn up by the R.G.S. was a system of "orthography for native names of places," and, strictly speaking, its object was to secure uniformity in spelling the names of outlandish places in our various colonies and elsewhere, of which the languages are legion and complicated. For that reason our two first rules especially lay down that no change is made in the spelling of foreign names in countries which use Roman characters, nor is any change made in the spelling of such names not written in Roman character, but which from long usage have become familiar to English readers.

Our rules, in fact, like the new German rules, are for our protectorates or *Schutzgebieten*. Therefore it is undoubtedly important that as the English and German protectorates are in many cases conterminous,

the orthographical rules of the two countries should be as nearly identical as possible. The principal value of such rules is for purposes of official correspondence, and above all for hydrographical sailing directions, and charts, and for maps. As one who for several years has had to do with map compilation, I naturally look to such rules from the point of view of the cartographer, and unhesitatingly maintain that any system of spelling which contains the quantity of diacritical signs, and arrangements of letters as does Dr. Köppen's, defeats itself and becomes impossible for the cartographer, or in fact for any *practical* use.

Dr. Köppen has produced with infinite study and care a system for an international rendering of geographical names, as near perfection as such a system could probably be got; but in order to embody every possible sound which can be thought of it has necessarily become complicated, and is a language of itself. It is far more extensive than are the English and French rules, in which simplicity and avoidance of diacritical signs is the key-note. It deals with *all* geographical names; ours and the new German system only deal with native place-names.

The subject is, however, of such importance that, as Dr. Köppen says, it is sincerely to be hoped that the next international geographical congress will deal with it. If a small international committee of English, American, French, and German experts were appointed to thrash out the question, it must result in good; and the valuable paper by Dr. Köppen, of which I have only been able to give a *précis*, and which deserves to be read in its entirety, could not fail to be of the greatest assistance to such a committee.

THE ACROPOLIS OF SUSA.*

By Major-General Sir FREDERIC GOLDSMID, K.C.S.I., C.B.

FAVOURÉD by the patronage and support of the French Government, M. Marcel Dieulafoy has, under the above title, produced a handsome and remarkable volume treating of the contents of mounds in south-western Persia, to which the attention of Biblical students has been especially drawn during the second half of the fast-closing century, though by no means ignored by earlier travellers and explorers. But the result of systematic excavations, carried on within the last decade of years, has a more cosmopolitan significance than is exemplified in substantial relics and valuable additions to the thesaurus of the Louvre. It is further notably displayed in the ventilation and propagation of archæological and ethnological theories, which, if they do not always

* 'L'Acropole de Suse; d'après les Fouilles exécutées en 1884, 1885, 1886.' Sous les auspices du Musée du Louvre. Paris, Hachette, 1893.

command the assent, cannot fail to invoke the interest of all seekers after historical truth. For the better prosecution of objects such as these the author has availed himself of the services of a learned member of his mission, M. F. Houssay, from whose separate work, '*Les Races humaines de la Perse*,' he has extracted the more pertinent and appropriate passages.

The book, although bearing the date of the current year, is not in all respects a new one. It is referred to by Mr. Curzon * under its present title as published in 1890; but as the work appeared in instalments, the allusion can only apply to a part of the later and complete issue. Nor must this particular issue be confounded with the author's former publication, '*L'Art antique de la Perse*,' which, together with the writings of his accomplished partner and fellow-traveller, Madame Jane Dieulafoy, has long enriched the bibliography of the Shah's dominions. In '*La Perse, la Chaldée, et la Susiane*,' the title given to this lady's clever and attractive papers in the *Tour du Monde*, we are manifestly brought to the very threshold of the more solid '*Acropole de Suse*.' All honour to our neighbours across the Channel, that whatever changes of government occur among them, in men or in form, whether the treasury be in the hands of imperial, monarchical, or republican keepers, and despite of the ever-existing necessity to equip fleets and armies, and keep up the paraphernalia of State to the full extent, the æsthetic is not swamped in the practical idea, nor is money grudged for the cause of science and scientific research. In England we give encouragement to this kind of thing when it suits our convenience, or entails no demand upon the public purse; but the cost of execution is met by individuals and societies. No better illustration of the case on either side could be furnished than by contrasting the modest octavo of '*Travels and Researches in Chaldea and Susiana*,' by Loftus (Nisbet, 1857) with the magnificent French quarto now under notice (Hachette, 1893), with its three hundred and eighty-six engravings, to say nothing of elaborate plans and maps. Loftus, it is true, was attached for the nonce to a Boundary Commission, so that his work of scientific exploration could take shelter under a quasi-political ægis; but Dieulafoy had a special mission of his own, with certainty of aid, if required, from the Republican Government and the local authorities.

'*L'Acropole de Suse*' consists of twenty-five chapters, of which the first three are introductory to the story of the excavations. But they are of equal importance with the rest of the book, and will possibly command a greater share of attention. No. I., headed "*Géographie Physique de l'Anzan-Sousounka*," gives its full signification to a compound name which at first sight will only be recognised by those who have some knowledge of the literature of the Cuneiform. Nos. II. and

* '*Persia and the Persian Question*,' vol. ii. p. 309.

III. are speculative historical treatises, to which is appended a summary of M. Houssay's ethnographical results. The outcome of local research is then shown under three main heads: "Fortification," to which five chapters are assigned; "Faïences" (comprising crockery, pottery, terra-cotta, and ornamental or decorative finds of sorts), which claim two chapters; and "l'Apadana and Ayadana." The last are the ancient designations of the Hall of the Throne and Fire Sanctuary, the original construction of which, and proposed reconstruction for present intelligibility, are questions elaborately treated in the five chapters that complete the volume. As it would be difficult to reproduce the several arguments used in support of theories advanced, and otherwise do justice to the conscientious labour displayed in these pages by a summarised analysis of their contents, we confine ourselves to a glance at some of the more striking features presented in them.

First, as to the identification of Susiana, the modern Khuzistan, with the "Anzan-Sousounka" of M. Dieulafoy. The question is one which should concern geographers; for although the word "Khuzistan" has, for administrative purposes, been superseded by the vague and pretentious "Arabistan," it is by the former only that we connect the province with the classical periods and remoter antiquity. About twelve or thirteen years ago Sir Henry Rawlinson deciphered for the benefit of a small audience at the Royal Asiatic Society's rooms in Albemarle Street, an inscription on a newly-discovered cylinder of Cyrus the Great. The monarch described himself, "son of Cambyzes, the great king, King of the city of *Anzan*," and the interpretation given to a till then unknown name was that it must refer to a part of Elam or its immediate neighbourhood. In favour of this view was alleged "the frequent junction of the name, especially in the astrological tablets, with *Subartu*, . . . a well-known title for the portion of Susiana which adjoins the mountains." But in a postscript to his published paper on the subject, Sir Henry stated that, since his notes had been in type, he had observed that Professor Sayce had already proposed to identify the word romanised into *Ansan* with a certain *Anzana*, which he claimed "to have found in the inscriptions of Susa and Elymais, as the native name of those countries, the common title of the Susian king being, according to this reading, 'Lord of the Empire of *Anzan*.'"* Somewhat later Professor Nöldeke, referring to the cylinder and a newly-discovered Babylonian tablet on which also the name *Anshan* (*sic*) appears, in connection with Cyrus, wrote: "*Anshan* has been looked for, without sufficient grounds, in the direction of Susiana. Even if it be true that *Anshan*, written as here in two ways, elsewhere means Susiana—

* *Journal of Royal Asiatic Society*. New Series. Vol. xii., Part I. (January 1880). See also, later in the same year, paper "On a Cuneiform Inscription relating to the capture of Babylon by Cyrus," in *Transactions of the Society of Biblical Archaeology*.

and this Oppert emphatically denies—we should still have to regard this only as a Babylonian inexactitude of expression. It is far more likely that *Anshan* was a place in Persis, the proper family seat of the Achæmenides, therefore perhaps near Pasargadae, or identified with it.*

Now let us turn to M. Dieulafoy, who seems to have satisfied himself on the subject, and has taken infinite pains to make his treatment of it exhaustive. Nothing daunted by time or change, he rushes to the *fons et origo* of his history, reverts to the early Biblical period, finds his starting-point in that wonderful tenth chapter of Genesis (so commonly passed over as one of names only), and boldly traces the fortunes of Elam, from the days of the son of Shem, to those of the Muhammadan Khalifs, a period roughly computable at three thousand years. Though this is no place in which to follow him, step by step, through his laborious investigations, we may state that, to achieve his purpose, he consults the ethnography of Persia generally, and its special developments in the south-west; the sculptures and inscriptions which come in his way, whether at Bésitûn, Malamîr, Mashhadi-Murghâb, Nakshai-Rustam, or Bushire; the classical authorities, such as Herodotus, Diodorus Siculus, Strabo, Quintus Curtius, Arrian, and others to whom even the more modern inquirers are so much indebted for light; as also the learned readings of Oppert and the better known interpreters of Cuneiform. Admitting the intervention of many and important gaps, together with long periods (even consecutive centuries) of doubt and obscurity, he finds that a certain Koudour Nakhounta (*sic*), King of Elam, is the first Susian potentate of whom any trace is obtainable; that, according to an inscription of Achebour (Assur) banipal he flourished in B.C. 2295; and that, having subdued Chaldæa, he founded the kingdom of Anzan-Sousounka. He was a predecessor, on the throne of Elam, of Koudour Lagomer (the Chedorlaomer of our English Bible), one of the four kings from whose hands the patriarch Abraham rescued his nephew Lot. Holy Scripture gives the date of this incident at circa B.C. 1913. Singularly enough the second Koudour Nakhounta does not appear in M. Dieulafoy's narrative until B.C. 693,† or sixteen centuries after the first; though we can hardly suppose that "Koudour Nakhounta II." is a strictly correct designation.

Our author adds that this Anzan-Sousounka, when consolidated as an independent monarchy, or up to the period of its conquest by Assyria in the seventh century B.C., comprised the south of Ardelan, Luristan, Arabistan, the Bakhtiâri Mountains, and the north-eastern shores of the Persian Gulf—practically, the larger portion of Western

* 'Encyclopædia Britannica.' Ninth edition. Vol. xviii. (1885), p. 565.

† 'Chronique Babylonienne d'Arrabelakkit' (Oppert's version). Mém. Paris Institut, 1887.

Persia between 26° and 35° parallels of latitude. The whole territory was divided into two governments, *i.e.*, Susiana or the plains, including the littoral of the gulf, and Anzan or the mountain ranges. Khuzistan would naturally fall into the former division. Not the least instructive result of his inquiries is the statement put forward in reference to the negro element in the population of Persia. His assertion that the plains and maritime parts of Susiana have been peopled by "Negritos," full and half-bred, will no doubt be attested by the ordinary traveller as well as ethnographer. These are not, he holds, the "Kushite" immigrants, traced by M. Eckstein and other writers from the southern slopes of the Hindu Kush, who, moving along the shores of Western India, had crossed over to the Persian Gulf, Susiana and Chaldæa, and reached the African Nile; nor is the so-called "Negrito" to be confounded with the real African negro.

It is presumed, then, that, for adaptation to modern times, and therefore illustratively rather than philologically, we may define Anzan-Sousounka, as Elam, or more strictly Elymais-Susiana. The second word belongs to the Sousa of Herodotus and Susis of Strabo, and has palpable affinity with the Scriptural Shushan and the now discussed and still more ancient Sousanka, while it is again to be traced in the "Susanechei" of the scribe and priest Ezra, whom M. Dieulafoy, according to the division of the books in the Latin Vulgate, calls Esdras.

As to the name *Khuzistan*, we are told, on the evidence of the inscriptions, that among the inhabitants of Anzan-Sousounka were four divisions of people known as Houssi, Habardib, or Hapartip (very suggestive of Sanskrit in its last syllable), Koussi, and Nimé. In the first and third, the common Indo-Persian termination, *stan*, would suffice to give almost the exact etymology required. M. Dieulafoy thus comments upon them, noting Oppert's authority: "Dans Houssi ou Khoussi on reconnaît la racine locale du nom—Uxie—attribution par les Grecs à l'extrême sud de la chaîne des monts Zagros séparative de la Suside et de la vieille Perse, puis la racine d'Uwaja, Khouz et Khouzistan, expressions géographiques dont se servaient les Perses du moyen âge pour désigner l'Arabistan moderne."

In Curzon's 'Persia,' vol. ii. p. 320, is the following footnote: "Khuzistan is thought to be derived from the word Uwaja signifying aborigines, that occurs in the Cuneiform inscriptions, and is, perhaps, also the origin of the Uxii of Strabo and Pliny. On the other hand Mordtmann derives Khuzistan from a Persian word meaning sugarcane."

To the above extracts may be added one from a curious, well-printed Elzevir duodecimo of 1633,* which states: "juxta mare *Abadan* . . . sita est terra *Chusistan* (nomen habens à Cossæis latronibus, quorum Plinius

* 'Persia seu Regni Persici status.' By John de Laet, a.d. (Leyden).

meminit liber vi., cap. 27) ad quam pertinet *Aheviz* et *Escar Mekrom* et *Gendi Sabur*, et *Susa* et *Ram Hormoz*." All these places now remain, or are capable of identification; but the derivation from the Cossæi looks unlikely. From the same little book we gather the historical fact mentioned by "Shikardus" (Schickard, *ob.* 1635) that in the twenty-first year of the Hijra, or about A.D. 642, one Mûsa Askari, despatched with an army east of the Tigris, occupied Khuzistan, with the two cities of Ahwaz and Susa.

Another question of geographical interest is that of identification of rivers in the immediate neighbourhood of Susa and the Memnonium. The four to which M. Dieulafoy gives the first consideration are: (1) the Choaspes, or Kerkha, an affluent of the Tigris; (2) the Ulâi or Eulœus, which connected the Choaspes and Koprates; (3) the Koprates or Abi-Dizful, coming down, like the Kerkha, from the mountains of Luristan; and (4) the Pasitigris or Karun, which received the waters of the Koprates, increased by those of the Choaspes passing through the Ulâi. For the second he finds no corresponding modern name, because he cannot accept the "ruisseau, le Chaour"—according to Loftus "a narrow stream" quite unsuited for identification with the waters on which Alexander sailed from Susa to the sea—to represent the river which, as we have the highest authority for believing, laved the walls of the Memnonium. But he has no objection to offer to the compromise by which Loftus accords to the "ruisseau" the honour of absorption into an artificial channel formed by a bifurcation of the Kerkha at some distance above Susa, corresponding with Ptolemy's "left branch of the Eulœus" on which the city is built. Captain Wells, it is true, visiting the locality in 1881, "could see no sign of the depression in which Loftus would have one believe the Eulœus once flowed." * This, however, is but the note of a passing traveller; whereas Dieulafoy, a repeated visitor and sojourner at Susa, wrote: "L'Oulai, aujourd'hui comblé, mais apparent sur son ancien parcours"—and so affirmed that the bed, though dry, was *en évidence*. Later on, the view which he entertains of his English predecessor's disposal of the whole question is stated in strong terms, and merits quotation: "La détermination du cours de l'Oulai pouvait seule présenter quelques difficultés; mais le problème, très bien posé par Loftus, a été résolu d'une manière décisive."

In the following extract from M. Dieulafoy's introductory chapters, it is not quite clear to what particular point in "the high table-lands of Susiana," he refers. The southern road appears to be the natural and more direct one to reach Fars viâ Bebehân. With regard to the route indicated as that of MM. Babin and Houssaye, Colonel Wells, R.E., marched from Ahwaz (west of Ram Hormuz) to Shiraz in fifteen days

* *Proceedings of Royal Geographical Society*, Vol. V., New Series (March, 1883), p. 155.

of December, 1881. The italics are in accordance with the original text:—

"The best map is misleading when consulted for information which it is unable to supply, such as the estimation, in stages, of a road to be traversed. The passage of the Zagros Mountains from Persepolis to Malamir is a long and painful military operation during the fine season, and impracticable in winter, although the actual wall scarcely attains in theoretical breadth 200 kilomètres. It has been indeed demonstrated from the information given by the caravan leaders—or, better still, reported by MM. Babin and Houssaye, in connection with their journey to Malamir, Ram Hormuz, and Shiraz—that *it is impossible to proceed directly from the high table-lands of Susiana into Fars*. It would be necessary either to move up again northward and reach Media, or to come down again southward and debouch by the Persian Pyloe. The journey by caravan, if the more direct road were chosen, would be from thirty-five to forty days in the fine season; while in winter the road is always covered with snow."

By the Persian Pyloe may be intended the *Pyloe Susidæ*, which Quintus Curtius refers to as the scene of dangers and difficulties for Alexander and his troops. But the position would be better understood with a more practical illustration.

Space is wanting to enter more fully into the merits of this remarkable publication, so creditable to the ability and industry of the author. We may not even venture into the domain of practical research, or speak of the excavations carried out, and their successful results; but our readers may be assured there is much in these things to fascinate and instruct. The volume is one which should find a conspicuous place in all high-class libraries and institutions.

In taking leave of M. Dieulafoy one brief extract may be appropriate, showing how, with the Arab invasion, the curtain falls on the history which he has sketched out with so much care as an introduction to the story of the disintombed Acropolis.

"Then came the Arab hordes. They disembarked at Muhamra, moved up the Karun, reached Shuster and Susa. At this period (A.D. 640) the legend of Daniel's tomb took shape, and the first funereal edifices or cenotaphs consecrated to the great prophet were reared. The Jews assembled in multitudes, as proved by research; then the desert, that inseparable companion of Islam, spread itself around the Sassanian cities, erst so populous, and over the lands erst so fertile. Ahwâz, Muhamra, Hawîzeh, Susa, Aiwan, Jûndi Shâpûr disappeared for ever; the latest Arab monuments yet indicative of living civilisation belong to the eleventh and twelfth centuries. Dizful and Shuster, raised from the ruins of Susa and peopled by its last inhabitants, alone outlived, wretched and devastated, this era of desolation. At the present day tribes but rarely traverse the Steppe, and these wonderful lands, where millions

could find a facile and plenteous subsistence, do not sustain 100,000 inhabitants. As for Susa, the mother of cities, she is reduced to a few ravined peaks covered with herbs and brambles in winter—dry, when the implacable sun burns the growing grass. How many centuries of glories and troubles, how many kingdoms repose under this accumulation of dust!"

A FRENCH ARCHITECT IN INDIA.*

By W. M. CONWAY.

In days not so very far removed from our own a man who had been to Rome was considered a great traveller. It is now easy to go round the world and to visit many of the most remote countries without transgressing the limits of touristdom, nor can one any longer readily define what it is that divides the tourist from the traveller. The essential qualities upon which the distinction depends belong rather to an attitude of mind than to a manner of moving about. George Borrow, crossing England in a railway train, was a traveller because he looked out of his head with a traveller's eyes. Most globe-trotters survey all countries in an unobservant, touristical fashion, and return from the farthest parts of the Earth without having experienced one of the emotions that the intelligent can derive from a walk in Surrey.

Our great dependency, India, which is becoming more and more the playground of the tourist, is a country abounding in interest for every intelligent traveller. It is not my purpose here to discuss all the diverse matters of interest that are ready to appeal to an intelligent eye, but to treat briefly a small group of them, and to point out how far a recently published work, issued under the auspices of the French Minister of Public Instruction, and lately added to the library of the Society, is worth the attention of intending travellers.

A difficulty, which I myself experienced on the occasion of a first visit to India, and which has doubtless been felt by many, is that of deciding what to see. In all countries called "old," the most noteworthy sights, after the living folk, are the architectural monuments of all ages. The man who has not been to India knows in a general way that it is very large, very various, the home of many races, the site of many ancient civilisations, and that it is dotted over with countless monuments. Which of all these should be visited? That is the problem that faces the intelligent traveller. If he sets to work to read up the subject, he embarks upon a wearisome and almost hopeless task. Fergusson, as an architectural critic, is far from reliable; as an art-historian is too much given to "believing" and having this and the

* 'Les Monuments de l'Inde,' by Dr. Gustave Le Bon, Paris, 1893.

other "guess" and "impression," where what the student wants is facts; as a mythologist he sees trees and serpents everywhere; and finally, as a writer, he is not, to say the least of it, invariably interesting. Moreover, the illustration of his book leaves much to be desired. If the student in his thoroughness proceeds to a lower stratum of research and burrows into the archaeological publications of the Indian Government, he enters upon about as forlorn an undertaking as the imagination can picture. When therefore there appeared, in all the sumptuousness of a quarto volume, published by the *Librarie de Firmin-Didot et Cie.* Dr. Gustave Le Bon's work entitled '*Les Monuments de l'Inde*,' we were not without hope that here at last French clearness of exposition and excellence of illustration had stepped in and accomplished what our own countrymen ought to have done for us long ago. A detailed study of this imposing work has not been so satisfactory in its results as one might have wished. The book has its merits; it has also grave defects. A brief and impartial statement of the one and the other may not be without a measure of utility.

Dr. Le Bon was sent out to India by the French Government with official credentials and a government subsidy. But, despite the pretensions of the opening chapters, his book is not an important contribution to the literature of the subject. With regard to English action in respect of antiquities, Dr. Le Bon shows some unfairness and prejudice. The only ancient monuments to which, he says, we pay the least attention, are those in Agra, Delhi, and the large towns; and this notwithstanding the fact that he himself photographed the Sanchi Tope in the really admirable state of preservation in which it is now maintained. He describes the vandalism at Gwalior as though it were still in progress, whereas the fact is that the damage done there was trifling, and the care now bestowed upon the antiquities of the citadel is more than could anywhere be paralleled in Algeria, where, for instance, at Tlemçen exquisite Moorish buildings are still mutilated by the local authorities. This is to be regretted, not because Dr. Le Bon's strictures are in themselves injurious, but because there is much still to be done in the matter of monument preservation by the Indian Government, and the suggestions of a wise foreign critic, who did not put himself out of court by his own evident lack of impartiality, would have been helpful to those in England and India who are anxious to see these matters thoroughly attended to by the authorities.

Beyond the photographs, there is little new in the book. In the case of the most ancient monuments, Dr. Le Bon is content to give a date without stating reasons or quoting authorities, and the dates given are, in many cases, by no means universally agreed upon by students. There is throughout a general lack of references to the literature of his subject, and his whole method is unscholarly.

Nor can Dr. Le Bon's judgments as an art critic command our assent.

He overpraises many things. The old residence of the Gwalior princes he describes as "a magic palace entirely encrusted with precious stones." The badly proportioned tomb of Etmad-ud-doulah, at Agra, a piece of marble confectionery, he considers about the finest work of the Mogul period. The decorative carvings at Sanchi, are, he says, as fine as "belles oeuvres dues au ciseau grec." A multitude of similar instances of false perception might be quoted.

Again, Dr. Le Bon complains that English writers call the style of the early Mussulman architecture of old Delhi Pathan, which it is; and then he goes on to say that this style does not differ from *that of the Arabs* except by some Hindu additions. As a matter of fact, the Arabs have not, and never have had, any style of architecture at all. The architecture of the various countries that have at different times embraced Islam arose out of Hellenistic, Byzantine, and Mesopotamian traditions, and contained no Arab element whatever.

There is only one satisfactory arrangement for a book of this kind, and that is the chronological. Art is a thing that develops, decays, becomes transformed, develops and decays again, and so forth. It is also influenced by locality and race; but time is the main factor within broad limits of area. There are certain great epochs of Indian as of European art. These the local arrangement chosen by Dr. Le Bon for the most part sets at naught. Two such closely-allied buildings as the Kutub and Ajmir mosques are widely separated in his pages. The reader is forced by him to hop about in the giddiest fashion amongst the centuries. This is all the more to be regretted because the admirable sketch which in one place he gives of the development of Mussulman architecture in India shows how interestingly he might have written had he adopted a sounder method.

In the present state of our knowledge it is the earliest known period of Indian art, when in the wake of Alexander's inroad and under the influence of the Greco-Bactrian kingdom the influence of Hellenistic art penetrated into the Panjab, that is of most interest to the European student. Before that time there were doubtless plenty of fine wooden buildings, sculptures in wood, rich woven stuffs, and other artistic products (though Dr. Le Bon seems to suppose that this was not suspected); but, a few excavated holes in Behar notwithstanding, there appears to have been neither architecture nor sculpture in stone. It was owing to Hellenistic influence coming doubtless through Persia and infected by Persia, that India was led to take this important step in art. The transforming power of India upon all manner of civilising influences certainly is and always has been great. It made both Greek and Persian forms disappear, but none the less did it receive an influence from the far-off Ægean, without which the history of architecture in India would not have been what it was. That Hellenistic influence was not communicated by a single impulse, but came as it were in

waves, has been amply proved by Mr. Vincent A. Smith in the *Journal of the Asiatic Society of Bengal* for the year 1889.

Existing bas-reliefs of the Gandhara school provide ample materials for the reconstruction of some semblance of the buildings in wood and crude brick, which were imitated by the earliest stone builders in India. The characteristic Venetian windows of the thirteenth and fourteenth centuries, those grouped under the "second order" by Mr. Ruskin in '*Stones of Venice*,' were closely copied from Indian arches such as are depicted on the old Gandhara bas-reliefs; and the Indian originals were themselves merely translations into stone of the form assumed by the gable end of a mud-built chamber, roofed with thatch. This fact, which I believe has not before been noticed, is worth recollection. It is to be hoped that some one will soon be found to bring together the considerable body of existing materials for the reconstruction of the early architecture of India, and thus to earn the gratitude of all students of the general history of art.

When we come down to later periods, our author is still frequently at fault. With reference to the Kutub Tower of Victory, which is not a minaret in the usual sense, a reference to Fergusson would have told him that there are earlier towers in the Ghazni country of the same type, from which it was obviously imitated; but then this would have militated against his opinion that there is nothing Pathan in the architecture of Old Delhi.

We should not have noticed the omission of ground plans of the buildings visited, did not Dr. Le Bon claim for that omission a kind of virtue.

I have now done with my strictures upon M. Le Bon's work, and warned the reader against what he will find of insufficiency in his treatment of his great subject. It remains only to point out the considerable utility which yet abides in this very attractive volume. The four hundred prints either processed or engraved from the author's negatives (with a few additions from other sources) form an invaluable collection of illustrative materials which will be of great interest to people of divergent tastes. Many of the plates, notably those taken in Nepal, are of buildings never photographed before. As a whole they form a series that illustrates the development of architecture in India in a fairly complete manner. It is unfortunate that Kashmir and Ceylon are both left out, but we must be grateful for what is included. With this book in his hand the intelligent traveller can before leaving home make his selection of things to be seen. It is not a complete collection, but, as far as it goes, it is of great value. England ought not to have been dependent for it on the enterprise of a Frenchman, and a subsidy from the tax-payers of France. If we could hope that the existence of this book might stir up English students to put an end to the present chaotic amateurishness of their writings about Indian archæology, we should welcome it even more warmly than we do.

THE UNIVERSAL ATLAS.*

WITH the issue of Part 28 this atlas, which was commenced in 1891, is complete. It is an English edition of Dr. Andree's well-known Handatlas, which created such a favourable impression when it first appeared in 1880, with the addition of maps, on enlarged scales, of England, Scotland, Canada, Australia, the Indian Frontier, and the Trade of the British Empire; together with others scarcely less important. It has been produced entirely for the use of English readers, the maps of the German edition having been added to, and corrected, so as to include in them the latest results of geographical research up to the date of publication. The work of transliteration has been carried out in a very satisfactory manner by Mr. W. J. Turner; but in a work of such magnitude, including 125,000 names, it can hardly be expected but that some oversights will occur. These, however, are unimportant, and few in number.

Considering the low price (£1 10s.) it is the best atlas, for the money, that has ever been published in this country. In saying this it is not intended to convey the idea that it is to be compared with the more expensive atlases in the market, such for instance as the new edition of W. and A. K. Johnston's Royal Atlas. Nor as regards the artistic merit of the maps, does it equal Stieler's Hand Atlas, and, indeed, considering the great difference of price, it could hardly be supposed that it would. It is, however, in all respects a thoroughly good and useful work, and as special attention has been given to the maps of the British Empire, it is far better suited to English readers for the purpose of reference than any of the more pretentious atlases published on the Continent.

Some idea may be formed of the estimation in which Dr. Andree's Atlas is held on the Continent, from the fact that as far back as 1891, no less than two hundred thousand copies had been sold in Germany alone, and that at the present time, a third edition is in course of publication, and special editions, which have been published in other countries, have met with a favourable reception. The enterprise of German map publishers will be better understood when it is known that the production of the first edition cost £50,000. The index with which this atlas is furnished has been most carefully prepared, and is a most valuable addition to the original work, which was without one.

* The Universal Atlas. Published by Cassell & Co., London, for the Atlas Publishing Company.

CAPTAIN BIA'S EXPLORATIONS IN THE SOUTH-EASTERN CONGO BASIN.*

Le Mouvement Géographique publishes letters from Lieuts. Francoqui and Derscheid which furnish interesting information on the expedition commanded by the late Captain Bia (see *Geographical Journal* for March, p. 227). Capt. Bia with his companions, Lieut. L. Francoqui, Lieut. E. Derscheid, Dr. Cornet, a geologist, and Dr. J. Amerlinck, arrived at Bunkeya on January 30th, 1892, where a fearful famine, which cost the lives of three hundred and forty-five men out of a total of five hundred and ninety-eight with whom he had started from Lusambo, detained him until the beginning of April. The corn began to ripen then, and he removed to Kipuna, a village on the Lufira, about 16 miles from Bunkeya. Rumours of the movements of two representatives of the British South Africa Company in the country to the east of the Luapula rendered an early start desirable. Capt. Bia consequently, accompanied by Lieut. Francoqui and one hundred and twenty-eight men, left on April 15th. On the 25th he reached the western shore of the Mweru. He examined the southern extremity of the lake, partly in a boat, and found that it nowhere exceeded 20 miles in width. The Mofwe, on the shore of which stands the residence of the Kazembe, is described as a distinct lake, about 16 miles long by ten in width. The Luapula, opposite Kazembe's town, is about 1630 feet wide and has a depth of 20 feet when in flood. Capt. Bia followed this river upwards, to near where it leaves the swamps lying to the south of Lake Bangweolo. He found it navigable as high up as the Mere Mere (Miele-Miele) Falls. Kinyama, one of the chiefs of the Bahusi, not only accepted the Company's flag, but also intrusted Capt. Bia with his nephew and successor, who is to be educated at Boma. After a visit to Chitambo's old village, where he attached a brass plate,† commemorating Dr. Livingstone's death, with which he had been intrusted by the English missionaries at Bunkeya, to a tree, Capt. Bia turned to the west, and on August 5th he rejoined his companions at Ntenke. Dr. Cornet, during his leader's absence, had explored the Konde-Rungo (Kundelungu) mountain, which divides the basins of the Zambesi and the Congo. He there visited the cave-dwellings of the Balomoto, high up on the escarpment which these mountains present towards the valley of the Lufira. Capt. Bia died at Ntenke on August 30th.

Lieut. Francoqui, upon whom devolved the command of the expedition, left Ntenke on September 14th, and in seven marches across a broad tableland, he reached the source of the Lualaba. He followed that river

* Compare the maps in *The Geographical Journal* for February and March.

† This brass plate bears, as was stated in *The Geographical Journal* last month, the simple inscription, "Dr. Livingstone died here May 1st, 1873." It was provided by Mr. Bruce, Dr. Livingstone's son-in-law.

downwards, past the Nzilo Falls, as far as the Lubudi, which joins it from the west. On that river Dr. Cornet made the interesting discovery of flint implements. Then going west, Capt. Francois reached the source of the Lubilash (Sankuru), traced that river downwards to its confluence with the Luwembi, and ultimately proceeded by way of Lupungu and Gongo Lutete to Luzambo, his starting-point, where he arrived on January 10th. Altogether the expedition marched nearly 4000 miles. Numerous positions and altitudes were determined. Dr. Cornet collected materials for a geological map, and altogether this expedition, jointly with that led by M. Delcommune, promises to yield scientific results of considerable value and interest.

THE ANTARCTIC WHALERS.

LETTERS dated March 9th from the Falkland Islands give some information of the movements of the Dundee whalers supplementary to the telegram referred to in last month's *Journal* (p. 362). As we feared no high latitude was reached, and the meteorological and other observations will consequently not have the value we hoped for. Icebergs of enormous size were met with, and the floes are in some cases reported as from 20 to 50 miles in length. The following is the official report as communicated to the newspapers by Mr. R. Kinnes, the agent for the Dundee vessels:—"The *Active* (Captain Robertson) and the *Balena* (Captain Alexander Fairweather) left the Falkland Islands on December 11th. After a week's steaming to the south in each other's company they reached the ice. On the 19th, however, a thick fog suddenly enveloped the ships, with the result that they passed each other, and thus got separated. The foggy weather continued unabated until the 23rd, when it sufficiently cleared, and, to the surprise of all, it was found that the *Active*, the *Balena*, and the *Diana* (Captain Robert Davidson) were in close proximity to each other. At this time the weather was cold and stormy; but, notwithstanding this, the captains and men adopted every expedient with the object of securing a catch. They cruised about in search of whales until January 2nd, proceeding as far as 67° S. No whales of value, however, were seen, the only varieties that were observed being finners and hunchbacks, which are quite worthless for the purpose the Dundee skippers had in view. The *Active*, however, managed to get fast to a large whale, the variety of which is not mentioned. Unfortunately it was lost, the harpoon having drawn. Seals were plentiful, and in a comparatively short time good catches had been secured, and between oil and skins the vessels were soon full. The skins are described as being very large, although their ultimate value remains to be seen. There was abundance of ice; but all the time the weather was extremely stormy. Had the atmospheric

conditions been more favourable, the captains state that they would have proceeded further south and remained as long as possible, with the view of discovering the real Greenland whale, as they had hopes that the variety they were in quest of might be found in more southern latitudes. The captains are of opinion that this season must have been one of unusual storm and severity. It will be remembered that Captain Sir James Ross remained in the Antarctic Seas until well on in May. This year, however, such a stay would have been impossible, owing to the state of the weather. The *Balæna* left the Falkland Islands for home on February 28th, and it is surmised that the others left about the same date. According to Mr. Kinnes's information the catches of seals are as follows—*Balæna*, 6000; *Active*, 4000; *Diana*, 4000; *Polar Star*, about 2000, each with large quantities of oil."

It will be remembered (*Proceedings* for 1892, pp. 637 and 862) that several of the vessels were equipped with additional chronometers, compasses, and other appliances for scientific navigation by the Royal Geographical Society, while the Meteorological Office supplied standard barometers, thermometers and hydrometers for atmospheric and oceanic observations. Mr. Leigh Smith, a large shareholder in the venture, equipped the *Balæna* with photographic apparatus, and with a complete set of appliances for all kinds of scientific collecting and preserving. The captains of the vessels cordially promised to do all in their power, consistently with their duty to the owners, to further scientific observations and collections; and, at the same time, they agreed to send in to the Society on their return a log of the voyage, embodying the routes, soundings, and position of any land seen in the far south. By the kind intervention of Mr. Leigh Smith, the surgeons of the *Balæna* and *Active* were selected on account of their knowledge and enthusiasm as observers and naturalists. In this way the Society did all in its power to make a daring commercial venture of solid service to geography and to science in general. The surgeons, who shared with the captains the regular meteorological observations, have written short notes, in which they state that all opportunities afforded them for work have been taken advantage of to the uttermost; but that the results are less than [they could have wished. They prefer, with perhaps a somewhat exaggerated sense of courtesy, to delay reporting on their scientific work until the return of the vessels, so that the captains may be able first to complete and submit their logs. The return of the ships may be expected early in June. A Norwegian sealer, the *Jason*, was also in the Antarctic regions this season, and returned rather before the Dundee vessels with a cargo of about five thousand seals. The nature of the seals is not known, no authentic information having been published on the subject. They probably belong to more than one species, and appear to be different from the common Greenland seal; but it is doubtful whether the true fur-seal was met with.

THE MONTHLY RECORD.

THE SOCIETY.

Royal Medals and other Awards for 1893.—The Royal Medals of this year for the encouragement of geographical science and discovery have been awarded by the Council as follows:—The Founder's Medal to Mr. Frederick Courtney Selous in recognition of his twenty years' explorations and surveys in South Africa. The Patron's or Victoria Medal to Mr. W. Woodville Rockhill for his travels and explorations in Western China, Koko-nor, Tsaidam and Tibet, and his observations on the ethnology and languages of the countries visited, published in his work, 'The Land of the Lamas,' for the enterprise and intrepidity shown by him, and for his years of study of the native languages to prepare him for these travels. The Murchison Grant has been awarded to Mr. R. W. Senior, who for several years in succession has carried out a most laborious duty in the higher ranges of Kulu and Lahaul, Punjab, the Himalayas; the results achieved in point of accuracy, expedition, and amount of work done, have been exceptional in the face of great hardships and great physical difficulties. The Gill Memorial to Mr. Henry O. Forbes for his explorations in New Guinea, the Malay Archipelago, and the Chatham Islands. The Cuthbert Peek Grant to Mr. Charles Hose for his explorations in Natural History Observations and Collections in Saráwak, North Borneo. The three Honorary Corresponding Members chosen are M. Vivien de St. Martin, the veteran French Geographer; Major J. W. Powell, Director of United States Survey; and Colonel Pevtsov, the well-known Russian explorer in Central Asia.

The Society's Prizes to Training-College Students.—The Royal Geographical Society's prizes for proficiency in Geography in the late examination of students in English training colleges, have been awarded by the Government examiners as follows:—Male students (prizes of £5 each): A. J. Catt, Borough Road Training College; R. W. Guppy, Exeter Training College; J. V. Semmens, Westminster Training College. (Book prizes): E. O. Cole, Exeter Training College; F. W. Millson, Borough Road Training College; W. H. Mizen, Borough Road Training College; E. A. Turner, Battersea Training College. Female students (prizes of £5 each): S. A. Crebbin, Whitelands Training College; L. S. Smith, Tottenham Training College; E. M. Williams, Stockwell Training College. (Book prizes): A. Baker, Ripon Training College; E. Hamlyn, Tottenham Training College; A. Nixon, Stockwell Training College; A. Pilling, Stockwell Training College.

EUROPE.

Russian Forests.—The Government of Arkhangelsk is usually described as containing more than 75,000,000 acres of forest land. It now appears, from communications made at the St. Petersburg Society of Forestry, that there are in the government of Arkhangelsk not more than 14 to 16,000,000 acres of timber forests, and these have already been considerably destroyed along the chief rivers. Ten saw mills are at work at the town of Arkhangelsk.

Distribution of Population in Schleswig-Holstein.—A recent issue of *Forschungen zur deutschen Landes- und Volkeskunde* consists of a monograph on the distribution of population in Schleswig-Holstein, by Dr. A. Gloy, on the lines followed in the anthropo-geographical works of Ratzel. Certain aspects of the subject having been already dealt with in 1861 and 1886 by K. Jansen, the present work is concerned chiefly with the agricultural population, under the headings of (i.) the distribution of the settlements over the country, and (ii.) their type. The system on which density of population may be best shown on a map is first discussed. The author points out the drawbacks of the common method, and pronounces in favour of Ratzel's idea of actually representing each separate settlement in its proper position, with an indication of its size. A map of part of Schleswig-Holstein constructed on this system is given, a series of seven symbols being used to denote places with populations varying from over two thousand down to ten, while isolated farms are shown by mere points. This method makes the use of a large scale necessary, but a special point in its favour is the possibility of using colours to show geological or other features, on which the "wherefore?" of distribution mainly depends. Schleswig-Holstein may be divided lengthwise into three geological zones: on the east the hilly ridge of glacial origin, with fertile soil (the upper and lower *Geschiebemergel*); next a sandy tract, with patches of heath and bog, mostly of the formation called *Geest* in Germany; lastly on the west a very fertile strip of fen-land, formed of a more or less sandy mud abounding in mica. To avoid confusion the separate formations (except the fen-land) are not distinguished on the map, but the patches of forest, heath, and bog, which account for the absence of population in certain parts, are inserted. It is impossible to form an accurate comparison between the densities of the three zones, each taken as a whole, there being an aggregation of population on the western edge of the *Geest* owing to the vicinity of the fertile fen-land, but in the case of separate districts those are the densest which have the largest share of loamy or clayey soil. The well-peopled tract shown by the map near the east coast, between the bogs of Kiel and Lübeck, as well as in the Island of Fehmarn, is just that where the lower *Geschiebemergel*, the most fertile formation of this zone, is found. It may be observed here also how, with an evenly fertile soil, the villages are on the whole placed at even distances apart. Where the geological formations are confused we find an irregular distribution of villages and single farmsteads, as in the central zone. A great part of this consists of uncultivable heaths, and where there is a moderate population (as in the line of fair-sized villages west of Rensburg), it is an unfailling sign of the existence of insular patches of glacial formation. The large population already noticed at the western edge of the *Geest* is due, partly to the greater security offered by the higher land, while any danger from the sea still remained, besides that by this situation of the villages, more of the fertile land was left free for cultivation. This line becoming a natural highway from

north to south, a further factor in the increase of population was introduced. The larger villages of the fen-land occupy isolated elevations formed by sand-dunes; elsewhere single farms are common, especially in the Eiderstedt District, where much of the land is given up to cattle-rearing. Under the second main heading the prevalence of the Slav type of villages is noteworthy. This shows a fixed plan in its formation, which allows of little subsequent expansion. The two principal forms are: (i.) the *Rundling*, where the houses are arranged in a horse-shoe, or sometimes a circular form, round an open space: originally one opening served both for ingress and egress; (ii.) the *Strassendorf*, where we have either straight lines of houses on each side of a broad street, or an arrangement derived by a broadening of the street to allow space for the church, school, etc. This forms a connecting link with the former type. Villages in the form of a rectangle also occur, chiefly in Fehmarn, from which this may be called the Fehmarn type. Plans of actual villages illustrating these different forms are given. The *Rundling* is found rather in the west of the old Slav District (west of the Oder), while the *Strassendorf* is most common in the eastern provinces of the Empire. Of German types the *Haufendorf* is the predominant type in Schleswig-Holstein; that of the fen-land is another, with the houses arranged in a single line parallel to a dyke or causeway. Farmsteads and country houses complete the catalogue. The lists of Slav villages given show that the western limit of their extension coincides with that of the glacial loam, and where isolated patches of the latter occur further west, traces of the Slav race are also to be found. It would be interesting to compare this Slav limit with the course of the "*limes Saxonius*" of Charlemagne, but our definite knowledge of the latter is scanty. There is no doubt, however, that the Slav race extended considerably to the west of the frontier laid down by that monarch.

ASIA.

The Afghan Frontier.—A dispute having arisen as to the respective rights of Afghan and Russian subjects at a point on the Afghan frontier almost due north of Herat, Colonel C. E. Yate has been deputed, with the consent of the Ameer Abdur Rahman, to discuss the question with a Russian officer, and if possible to effect a settlement. The difficulty relates to the use of water from the Kushk River for irrigation purposes. When the Anglo-Russian Boundary Commission reached the Kushk Valley in November, 1885, it was found that the Sarik Turkomans were in possession of the side valleys of the Kushk and Kashan Rivers; and the Russian Commissioner demanded that they should not be interfered with. The claim was resisted by Sir West Ridgeway, on the ground that it was contrary to the terms of the London protocol of September 1885; and the Sarik Turkomans were accordingly ousted, the boundary line being so drawn as to reach the Kushk River at a point a mile or two above Chaman-i-Bid. Some months later, when a difficulty arose as to the demarcation of the frontier in the neighbourhood of the Oxus, the English authorities, in order to secure Khamiab for the Afghans, consented to a re-adjustment of the boundary in the Kushk Valley; and the boundary pillars were removed some distance to the south. Since then, cultivation in the lands given up to Russia has been carried on not only by the Sarik Turkomans, but also by a

party of colonists from European Russia. It is now alleged that by diverting the waters of the Kushk for the irrigation of their own fields, the Aghans have deprived both Russians and Turkomans of their fair share in the river. The dispute, if left unsettled, might give rise to serious complications; but it is hoped that the joint Commission will be able to suggest a compromise satisfactory to both parties.

The Mission to Chitral.—The Hon. C. G. Bruce, who accompanied Dr. Robertson's mission to Chitral, gives in some private letters a lively account of the march of 200 miles through snow from Gilgit over the Shandur Pass (12,250 feet) in January last. The weather was cold throughout, when the party started in the morning the thermometer registering from 0° to 5° F., and bitter winds frequently blowing. They stopped for one day at the fort of Maating, the residence of the late Mehtar Afzul-ul-Ismilk (Aman-ul-Mulk) in an open plain surrounded by vast mountains at the meeting of three valleys and bitterly cold. Here the reigning Mehtar met the expedition and accompanied it to Chitral, where they were comfortably housed. The country seems to be in a very depressed state; three recent changes of kings accompanied by bloodshed and plundering have had their natural effect—the people seemed half-starved. The situation of Chitral is fine with grand views of lofty bare mountain slopes diversified by great scenes, while the fine, two-peaked mountain Tirech Mir, 25,000 feet high, fills up the head of the valley at a distance of 30 miles. Some Kafirs who came down from Kafirstan to see Dr. Robertson are described as a wild set of men, most independent in their bearing, very light and agile in their movements, having their heads shaved with the exception of one cherished tuft on the crown. Their favourite weapon is the dagger, although they also use the bow. They are magnificent mountaineers.

Dr. Radde's Expedition to the Western Caucasus.—An Odessa correspondent writes that Dr. G. Radde, Director of the Natural History Museum at Tiflis, a Medallist of the Society, started from Tiflis early in April on a four months' tour in the Western Caucasus and along the eastern shores of the Black Sea. He will then visit Nakalakévi, according to Dubois the birthplace of Medea, and the scene of the adventures of the Argonauts. Dr. Radde will also make collections in Sukhum Kale and along the Black Sea littoral to Novo-Rossisk. The Kuban district about Ekaterinodar will also be laid under contribution. From the Cossack Station of Psebai Radde intends crossing the Caucasus *viâ* Fisht to Sochi on the Black Sea, whence he will return to Tiflis, finishing probably in August.

Railways in China.—It is reported in the Chinese newspapers that the North China railway is to be extended immediately through

Manchuria to the Amur River, the survey for the proposed extensions being already completed. The line already runs from Tientsin to Tongku, near the Taku forts, a distance of 27 miles, and is continued for 67 miles further to the Tungshan and Kaiping coalfields, and for 40 miles beyond towards the Manchurian frontier. The strategic importance of a railway northward to meet the Russian railways seems at last to have overcome the obstinate conservatism of the Chinese government, and the many obstacles so long declared to be insurmountable have one by one given way. The possible expansion of railway enterprise in China is a fact of the first magnitude, geographically, commercially, and politically.

Vladivostok and Korea.—In his report on the trade of Korea for 1891, recently published (Foreign Office, 1892, *Annual Series*, No. 1088, Korea), Mr. W. C. Hillier, refers among other things to the future importance of Vladivostok. That port is rapidly becoming a commercial terminus of great importance, and as the construction of the Trans-Siberian Railway proceeds there appears to be little doubt that trade will largely increase. It is expected that a large portion of the brick-tea which now finds its way into Siberia *via* Tientsin and Kalgan will eventually be shipped from Hankow to Vladivostok, while the extension of the railway cannot fail to open up new districts, at present very sparsely inhabited, of which Vladivostok will become the centre. The exports from Korea to Vladivostok now consist almost entirely of cattle and food-stuffs, but a native passenger traffic is being developed, which is likely to expand as the demand for labour increases. The growth of this little-known Russian port during the past few years, even in its present condition of isolation, and ice-bound as it is during at least four months in the year, is very striking, and there is every reason to believe that when railway communication with the west is completed it will become one of the most important places in the far East. A large Chinese and Korean population is already established there, and vast tracts of apparently rich country remain to be opened up to the agriculturist. From the same report we learn that there is a steadily increasing immigration to Korea of Chinese and Japanese; these number in Sŭl alone about 1300 and 1000 respectively; while in Chemulpo there are 550 Chinese and 2330 Japanese; the numbers at Fusan being: Japanese 5255, and Chinese 138. Mr. Hillier also supplies in his report some useful hints regarding sport in Korea. Tigers, leopards, bears, and deer, appear to be plentiful, especially in the northern districts. Pheasants and wild fowl also abound. The country near the coasts is the resort of millions of wild fowl, swans, geese, duck, and teal during the season; while trout and salmon are plentiful in the streams on the north-east coast.

AFRICA.

Mr. J. W. Gregory's Expedition in East Africa.—Owing to the collapse of the expedition which left England in October, 1892, under the command of Lieut. C. Villiers of the Royal Horse Guards, Mr. J. W. Gregory, Assistant in the Geological Department of the British Museum, who had joined the party as geologist and naturalist, has been left alone at Mombasa. Lieut. Villiers' party only got as far as Ngatano on the Tana River, where the leader left them, and the other members returned to England. Mr. Gregory has, however, determined not to leave the

country until he has done some scientific work, and in a letter dated Mombasa, March 21st, 1893, states that he has organised a caravan of his own, and was to start for the interior on the following day. He intends to investigate the geology and natural history of the Ulu mountains, and of the chain of lakes from Naivasha to Baringo. The return journey will be made across the Lykipia plateau to the west base of Kenia, and Mr. Gregory will attempt the ascent of that mountain; being, however, the only European in the party, his difficulties will be considerable. Leaving Mount Kenia, he intends to proceed to the Sabaki River, the geology of the surrounding country being of special interest. In addition to his knowledge of geology and natural history, Mr. Gregory, before leaving England, further qualified himself as an explorer by taking lessons in practical astronomy and surveying from the Society's Instructor. It is therefore to be hoped that, notwithstanding the unfortunate collapse of Lieut. Villiers' exploring party, some useful work may yet be done by the only one of its members, who declines to return to England without doing something to add to our geographical knowledge.

Mr. Bent's Expedition to Abyssinia.—The following letter has been received from Mr. Theodore Bent, under date, Addi Huala, March 7th, 1893:—We have just got back to Italian territory again after having had a very anxious and dangerous sequel to our Abyssinian experiences. Directly after my last letter to you, news reached Adua that Ras Alula had rebelled again, and that Ras Mangascia was collecting an army and coming to Adua. We packed all our things in great haste, and were prepared for flight, but next day news was brought that the seat of war would be some days' journey from Adua, and the Italian Resident thought we might proceed to Aksum, but warned us to be prepared for flight at a moment's notice. We passed eight days at Aksum, with great profit, I hope, to ourselves and archaeology, for though under the circumstances it was impossible to do any excavation, we found plenty of work amongst inscriptions, obelisks, &c., to keep us well employed for that time—taking squeezes, photos, measurements, &c. We then got intimation from the Italian Resident at Adua to depart immediately; that the war was assuming alarming proportions; that the north of Tigre was infested by bands of brigands; and that our ultimate retreat out of the country was very doubtful. We packed up in haste, and availed ourselves of the escort of a chief going to join Ras Mangascia to get back to Adua. There we found the Italian Resident in a great state of alarm. Ras Mangascia wanted both him and us to join him at the war, and refused to give us an escort to the Mareb. The road being infested with brigands, it seemed as if we were caught in a trap, and that the only thing was to join Ras Mangascia and take our chance in the war. We passed two very anxious days, not knowing what was going to happen to us. The Governor of Adua was exceedingly rude

to the Italian Resident, and things looked very black. Luckily, however, at the first intimation of difficulty, the Resident had sent on word here of the condition of affairs, and to our intense relief we got word that Lieutenant Mulazzani, with a force of four hundred men, had crossed the frontier and was coming to our relief. In this manner we got away, and reached Italian soil after a two days' march. This is quite the most unpleasant experience we have had during any of our travels, and I need hardly say we are enjoying a few days of rest and tranquillity here immensely. I think, in spite of our difficulties, we have done some good and important work at Aksum. We shall probably go on to Aden in a fortnight's time, and get back to England earlier than we expected.

The Equatorial Lakes and the Irrigation of Egypt.—In the sixteenth century we heard a great deal about Prester John's threat to divert the "Nile" into the Red Sea, and thus to deprive the unbelieving Egyptians of the supply of water so essential to their prosperity. Of course the Nile here referred to was neither the "Blue" nor the "White" Nile, but the Takazze, or Atbara, which, though very inferior to the two main branches of the great African river, nevertheless contributes very largely towards the annual floods. M. A. Chélu has quite recently pointed out that a similar danger would threaten the "low" Nile of Egypt, if a dam were to be built across the outlet of the Victoria Nyanza, as to the waters stored up in this huge equatorial lake Egypt is indebted for its summer supply. On the other hand these African lakes, in the opinion of practical engineers, might be converted into huge reservoirs, the supply from which could be regulated by a weir built across the outlet of the Albert Nyanza. It is claimed for this scheme that the supply of water obtainable would far exceed that obtainable in any other way, and that the cost would be infinitely less. Nothing, of course, can be done in this direction until Uganda and the old Equatorial province shall have been re-occupied by a civilised power.

Emin Pasha.—When Emin Pasha separated from Dr. Stuhlmann it was his intention to follow the divide between the Congo and Nile, and to make his way to Lake Tsad. If rumours current at Kampala (Uganda) can be trusted this bold scheme has been violently frustrated. Awad Efendi, an old Egyptian official, now in the service of the British East Africa Company, told Herr W. Wolf, the special correspondent of the *Berliner Tagblatt*, that Emin Pasha had left Kavalli on March 9th, 1892, that his caravan had been attacked on the Huri River by a band of Manyema under the orders of Ishmail, the wakil of Said-bin-Habid, and that Emin Pasha and all his followers had been massacred. This hearsay news certainly requires confirmation.

African Salt.—The importance attached to salt (chloride of sodium) by the natives of almost all parts of Africa is well known, and a

French company has recently introduced for purposes of trade specially made bars of pure salt, compressed and polished so as to be hard and easily carried. In the absence of any natural supply of common salt various substitutes have been made and used by savage tribes. M. Dybowski, on his recent journey on the Mobangi, noticed that the cannibal Bonjos collected plants of various orders which float down the river, and, after drying and burning them, extracted salt by means of solution, filtering, and subsequent evaporation. M. Demoussy publishes an analysis of this salt (*Comptes Rendus* 116 (1893), 398-400), which appears to contain no chloride of sodium whatever, its chief constituents being sixty-eight per cent. of chloride of potassium, and twenty-nine per cent. of sulphate of potassium. Further inland, toward Lake Chad, the natives were found to make and use with their food a "salt" of identical composition. The very small proportion of carbonate of potassium present in these salts is remarkable, and those species of plants which yield least carbonate on burning are evidently carefully selected. The Senegalese porters who accompanied M. Dybowski used the native salt freely without experiencing any ill-effects. It would be highly interesting to study the effect of potassium salts in large quantities on the system in the case of the Bonjos. The relation between cannibalism and abstinence from chloride of sodium noted in 'Robinson Crusoe' is curiously confirmed in this instance.

Present Condition and Prospects of Zanzibar.—Mr. Fitzgerald in his recent report on Zanzibar (Foreign Office, 1892, Miscellaneous Series, No. 266), enters somewhat fully into the agricultural conditions and prospects of this island, which at the present moment has acquired special interest on account of the British occupation, and the recent change of Sultan. The island of Zanzibar lies well within the tropics, between latitude 5° and 6° south of the Equator, and is from 25 to 30 miles distant from the mainland. The island is of coral formation, on a substratum of sandstone rock. According to Dr. James Christie—"The madrepor structure is evidently based upon the summits of an abrupt and sharp rising submarine range which, of course, must have been under the ocean-level at some remote period. By the action of the gradually subsiding waters a coralline conglomerate has been formed. On the southern and eastern parts of the island the deposit is more scanty. . . . Where sufficient deposits have been left the soil is fertile and the crops early, the porous understructure carrying off superfluous rains, but still retaining moisture and heat. Zanzibar, like all other madrepor islands, grows towards the leeward, and on that side the most fertilising deposits take place. Thus the barest and most infertile parts of the island are those exposed during the greater length of time to the influence of the long continuous south-west monsoon; and the most fertile are those sheltered from the violence of the south-west, and exposed to the north-east." The total area of Zanzibar may be put down at 400,000 acres, its greatest length being 50 miles, and its breadth from 20 to 27 miles. Zanzibar appears to differ materially from other tropical islands in the matter of possessing no mountain range; the low hilly ridge which takes its place traversing the island in its entire length, and almost through its centre, has by measurement been proved not to exceed a height of 440 feet. Another remarkable feature is the

apparently very large extent of land unfit for cultivation, which, according to a trustworthy authority, includes the larger part of the island. Zanzibar may be thus divided into two portions—the fertile and the barren. The latter extends over the coast lands of the eastern side, and nearly all the southern part of the island, and consists of an universal outcrop of sharp and jagged coral rock; but it is everywhere covered with low bush, vegetation, and grass. In this portion of the island the Wahadina people (the original inhabitants) reside. The fertile area covers the whole of the western and northern side, and also the eastern face of the central hilly range. As to the rainfall of Zanzibar—the result of the five years' meteorological observations taken daily by Dr. John Robb on Ras Shangam, the point of land on which the town of Zanzibar is situated, extending from 1874 to 1878, gives a total average fall of 61.01 inches. The fall was apparently evenly distributed, Zanzibar feeling the influence of both the south-west and north-east monsoon. According to Dr. Robb's observations, the mean temperature of five years is $80^{\circ}3$, and the average yearly range from highest maximum to lowest minimum is $17^{\circ}3$. Of the cultivated products of Zanzibar the clove and the coconut are apparently the most important. The clove tree (*Caryophyllus aromaticus*) is stated to be a native of the Moluccas, and appears to have been first introduced into Zanzibar by an Arab at the end of last century. The average length of life of the clove tree in Zanzibar appears to be from sixty to seventy years; owing, however, to the devastation resulting from the great hurricane of 1872, the average age of the trees now growing may be put down as below twenty years. The exports of cloves from Zanzibar in 1890 was 124,929 frasilas, and from Pemba in the same year, 385,981 frasilas; in 1891 the export from Zanzibar was 62,017 frasilas, and from Pemba, 326,986 frasilas. The coconut palm, like the clove tree, is found all over the fertile portions of the island, and to be very extensively cultivated. Other trees of importance cultivated in Zanzibar, are the areca nut, mango, jack, cotton-wood tree, papaw, foreign and native fruit trees and coffee. The alimentary plants include sugar-cane, bananas, rice, cassava, Indian corn, beans and peas, arrowroot, pine-apples, capsicums, and ground-nuts. The oil-plants are sesame and "mtono"; vegetables, sweet-potatoes, pumpkins, condiments, etc. The second part of the Report is occupied with the results of Mr. Fitzgerald's recent tour of inspection of the island for the purpose of studying the present position of native cultivation and agriculture, and more particularly of the spice industry. Mr. Fitzgerald's route may be briefly described as follows: North, from Zanzibar to Kokotoni, distance 21 miles, halting on the way at Chueni; south, returning from Kokotoni by Mdo, distance five hours to Dunga, distance from Mdo two hours and a half; east, visit to barren portion east of Dunga; west, Dunga to Zanzibar, distance 12 miles, visiting the Valley of Bonde la Msungu on the way. It will thus be seen that the whole of the more important portion of the cultivated area was traversed, while a brief visit was made to the more barren and exposed side of the island. There appears to be a very marked similarity of rainfall, temperature, and also of soil, between Zanzibar and the islands of the West Indies, and in Mr. Fitzgerald's opinion there can be no doubt that the products cultivated there, with the exception of those grown at higher elevations, can be successfully introduced here also. He also endeavours to show that the present products now growing are capable of very great development. With regard to the labour question which is affecting Zanzibar at the present time, Mr. Fitzgerald says: "Certainly this labour question is a most important one, and forms the basis on which future agricultural development must necessarily depend; and with the island mainly depending, as at present, upon one product like the clove tree, which especially requires a large labour supply, this becomes a most urgent and important matter." He is also of opinion that "to thoroughly develop the resources of Zanzibar, European enterprise is undoubtedly

the factor required, and the sooner this can be more largely attracted, the quicker will development commence."

Dr. Fleck's Journey Across the Kalahari to Lake Ngami.—In this journey, made in 1890, and now described in *Mittheilungen aus den Deutschen Schutzgebieten* (vol. vi., no. 1), Dr. Fleck traversed the little-known western part of the Kalahari. His routes may be followed on Kiepert's map in the same periodical, embodying the surveys of C. von François, who travelled in the same parts in 1890-92. Coming from the west, Dr. Fleck struck the upper Nosob at Andreas Lammert's *verft*. The territory of this chief is of vast extent, considering the small number of his people (about 1200). They are wretchedly poor, living chiefly on wild fruits. After following down the Nosob for some distance, our traveller struck eastward across a waterless region, where he encountered the usual troubles of such a journey. Having paid a visit to Mapaar, chief of the Kalahari Bechuanas, at his *verft* Hututu (wrongly Lehutitang on our maps), he struck northwards, again experiencing want of water, and joined the direct route from Rehoboth to Lake Ngami, taken by previous travellers, at Gansis. Passing along the west shore of the lake, and with some trouble getting his waggon across a branch of the Okavango, he at length reached the town of Moremi, the Bechuana chief of this district. This is further north than it is placed on the map, being close to the sharp bend of the Okavango. Dr. Fleck describes the Kalahari as not a desert—everywhere is good grass, succulent bushes and green trees, large-leaved species of *ficus*, etc., being common. At first the trees and bushes were continuous, but later they occupied the tops of the sand-dunes, the hollows being filled with grass. The soil is a red sand, alternating with strata of limestone resting horizontally on the ancient formations. When this is pierced, a better supply of water will probably be obtained. The Bakalahari (Bechuanas) are crafty and indolent, but the Bushmen are easier to deal with. The periodic rains allow the former to grow Kafir-corn, maize, water-melons, etc. They also have some cattle. The Bushmen live on wild fruits. The neighbourhood of Lake Ngami is much praised for its beauty and fertility, and might, Dr. Fleck says, become a paradise in the hands of Europeans. Only a small part of the surface is at present cultivated. The neighbourhood of Moremi's town is uninteresting, but near the river large-leaved trees covered with gay creepers abound. With care the climate is healthy, the natives suffering chiefly through their own excesses. All traces of fever disappear when the flood comes down the river in the dry season, which consists merely of a series of pools. The chief showed no signs of energy or intelligence, and no good character can be given to the people. A strange custom is the assemblage of the young girls from all parts of the country for a three-months' course of instruction in their future duties as wives. Every night they parade the streets masked, and make the whole place resound with singing, shouting, stamping, and beating of drums. An excursion along the southern shore to the only spot where the reeds (*papyrus*, etc.) allow access to the water gave an opportunity for examining the lake from a canoe. Its shores abound with pelicans, ibis, and other birds. Its depth seems very slight. Other large lakes of this nature must have existed within historic times, and the limestone strata, a large area of which is crossed by the road from the south-west, are the deposits formed on their beds. It may be noticed that the surveys of Von François above mentioned considerably alter the map of the Western Kalahari, for which that of Th. Hahn (Cape Town, 1879) has been the chief authority hitherto. The middle course of the Nosob, for instance, is shifted a long way to the west, as also the Hogskin *Vley* in Vilander's country. According to Kiepert's map almost all the latter would seem to lie west of the German boundary, though a large portion of it has been recently annexed to British Bechuanaland.

AMERICA.

Topographical Work Done by the Appalachian Mountain Club.—The February number of *Appalachia* contains a map on which all the prominent summits in New England and Eastern New York are indicated. Many of these, especially those located in the White Mountains and the adjacent district of the State of Maine, are from the original work of members of the Appalachian Mountain Club, which has already been published. In addition to these, only the determinations of other accurate surveys have been used in the construction of the map, and since such surveys have not been completed in Maine, New Hampshire, Vermont, and New York, it follows that the map is incomplete in those parts, while in other districts the position of more points have been determined than can be placed on the map without overcrowding. As regards the map itself it is a somewhat rough production without hill-shading or contours, and is chiefly remarkable as being the work of members of a club who, by their praiseworthy efforts, are making valuable contributions to the knowledge of the topography of this part of the United States.

Jamaica.—In the Annual Colonial Report for 1891-92 on Jamaica, some details are given as to the possibilities of the country. The island contains about 2683 acres, and of this 413,000 are level ground. There are 640,000 acres under cultivation, although of this amount more than half is in common pasture. Along the centre of the island run ranges of hills attaining an elevation in the west of 1800 feet, and in the east of 7500. Consequently there is a great variety of soil and of climate, and almost every tropical product, and many products of the temperate zone, can be successfully cultivated. The north of the island is several degrees cooler than the south, because Jamaica lies with its larger axis from east to west, and the constant north-east trade wind serves to keep the northern coast cooler. All round the coast there is a strong sea-breeze by day and a cool land-breeze at night. During the year 897 miles have been added to the main-road system, several of the dangerous rivers on the north side have been bridged, and in the course of the next three years it is hoped that every river in the island will be bridged. The sudden and dangerous river-floods annually occasion the loss of many lives. It is expected that within two years the extension of the railway to Montego Bay will be completed. From the report on the Botanical Department we learn that the Hope Garden is gradually being formed into a geographical garden, the total area of which is 212 acres. Of this, 38 acres have been left in wood; some space has been devoted to economic plants, sugar-canes, and hemp; large numbers of ferns have been planted, and much of the ground has been left covered with Bahama grass. In the island there are several mineral springs of great value, and the general climatic conditions are beneficial for sufferers from lung-diseases.

Geographical Distribution of Animals in South America.—In a letter to the Société Scientifique du Chile, Dr. H. von Thering, naturalist of the National Museum of Rio de Janeiro, calls the attention of that society to the curious relations that exist between the faunas of South Brazil and Chili, which he is now carefully studying.

Studies in the Strait of Magellan.—MM. Lemétayer and Blanchard have been lately studying the climate of Punta-Arenas, the Chilian settlement in the Strait of Magellan. M. Blanchard succeeded in making eucalyptus grow in the open air. Dr. Frederico T. Delfin has been studying the natural history of Punta-Arenas.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Cable-Soundings in the Pacific.—Commander Tanner, U.S.N., describes the recent work of the U.S. ships *Albatross* and *Thetis* in surveying possible routes for a cable between San Francisco and the Hawaiian Islands in the last number of the *Transactions of the Geographical Society of the Pacific*. He commenced work in the *Albatross* on October 11th, 1891, off Salinas in the Bay of Monterey at the head of a great submarine cañon which carried deep water close to the shore. The axis of this trough was followed until oceanic depths were reached, and a great-circle course was then followed to the island of Oahu, soundings being taken at intervals of 5, 10, and finally 15 miles. The gradual increase of depth continued for 486 miles from Salinas, where it was 2895 fathoms, then gradually diminished to 2014 fathoms about 690 miles from the Californian coast. This elevation was steeper on the western side, and in crossing it close soundings were made. For 146 miles farther the line showed depths of 2400 to 2700 fathoms. On another trip the ship passed within 8 miles of the elevation previously found without any change of depth. A somewhat remarkable depression with one sounding of 3186 fathoms was found in $31^{\circ} 54' N.$, $136^{\circ} 44' W.$, which was the deepest water found on the survey. A slight rise followed on which, at a depth of 2085 fathoms, particles of sand were detected by the microscope in the ooze which covered the bottom, a circumstance of very rare occurrence. A stretch of 700 miles followed with average depths of 2900 fathoms; but 210 miles from the east end of Oahu an elevation with a depth of 1256 fathoms was found separated from the land by a depression of over 2800 fathoms. Several lines of soundings were taken up the relatively steep slope to the coast, all of which showed a gradual rise forming a good bed for a cable. Waikiki, about 3 miles from Honolulu, was fixed on as the best landing-place for a cable. On December 12th, 1891, the *Albatross* started to sound a rhumb-line to San Francisco, the maximum divergence of which from the great-circle route followed in the outward voyage was 70 miles. From a depth of 603 fathoms 20 miles from land there was a descent of 1178 fathoms in 4 miles, a slope of 1 in 3.5, but notwithstanding its steepness no rocks were indicated. On the whole the character of the depths was similar to that of the outward voyage, the greatest depth met with being 3038 fathoms. There were several gentle rises on which the depth was under 2000 fathoms. Commander Reiter on the U.S.S. *Thetis* surveyed a third possible line for the cable in April 1892 from Point Conception to Hilo in Hawaii. Similar conditions were found, the most notable rise, named after Reiter, occurring on the great-circle course 405 miles from Point Conception with only 976 fathoms over it, while the surrounding ocean bed had a normal depth of 2500 fathoms. The later part of the line showed greater depths and a more rugged sea-bed with signs of recent volcanic disturbance. The maximum depth of 3228 fathoms occurred within 230 miles of Hawaii, indicating an extensive trough surrounding the whole island-group on the east. The *Albatross* great-circle line was 2091 miles, the *Thetis* line 2050 miles in length. No obstacle remains to the laying of a cable save those of an economic kind.

CORRESPONDENCE.

Why are the Prairies Treeless.

PRYORS, BROOMFIELD, CHELMSFORD.

Feb. 7th, 1893.

SIR,—I have received from Professor G. M. Asher, LL.D., the accompanying interesting letter in reference to my article, "Why are the Prairies Treeless?" which appeared in the *Proceedings* of the Society in February last (pp. 78-100). With Professor Asher's consent, I send it for publication in the *Geographical Journal*. In so doing, I may perhaps be allowed to remark that, whether or not my somewhat bold contentions ultimately prove tenable, I do not admit that Professor Asher's criticisms (interesting though they certainly are) in any way controvert them.

In my article, I spoke of the American prairies only. I was careful to explain (p. 99) that the other treeless grass-covered areas of the world might, or might not have been due to burning; but of them and their origins I knew nothing personally. Professor Asher argues that the Russian Steppes are not treeless by reason of frequent burnings (which may be, and no doubt is, quite correct); but it does not follow that the American prairies are not treeless through that cause. I can only again assert my belief that they are. Dr. Asher's remarks show that there are no traditions of an ancient forest growth having once covered the Steppes. With the prairies the case is widely different, and there is the clearest evidence that enormous areas have, within recent years, been converted from forest into prairie by fire. Again, Professor Asher states that, on the Russian Steppes trees can only be grown by means of laborious irrigation. On the prairies of America, I have shown that the case is widely different. Professor Asher's statements as to the presence of "salt" on the Steppes, show that, in this respect, they closely resemble the prairies, on many parts of which "alkali" abounds. On the Russian Steppes (so far as I know, for Professor Asher does not allude to the point), fires are not, and never have been, prevalent; while on the prairies they are annual; and I say again that, if fires did not originate the prairies themselves, at any rate they have enormously extended their area, and are still doing so.

I am, yours faithfully,

MILLER CHRISTY.

The Editor of *The Geographical Journal*.

29, DUKE STREET, BLOOMSBURY.

Jan. 23rd, 1893.

SIR,—Your interesting essay under the title, "Why are the Prairies Treeless" (which you send me because I am acquainted with the Steppes of Eastern Russia) takes, I believe, too narrow a view of the question, else you would scarcely entertain the idea that the treeless condition of the Prairies is due to fire.

Not only are the prairie regions of North America and the Steppe regions of Eastern Russia covered with wild-grown grasses, but so also are many other wide tracts, especially in Southern America and in Western and Central Asia; and much land that is now cultivated has, within the memory of man, or in prehistoric times, likewise been Steppe. Such being the case, the first thing to ask is, whether it is probable that, in accordance with your theory, a considerable portion of the Steppe lands was deprived by fire of trees with which it had been covered, so as to be turned from forest into Steppe.

Now such an origin of the grass-covered lands seems to me very unlikely, for the simple reason that land covered with wild-grown grasses can have no other inhabitants than nomads or savage hunters, that is to say, populations very scanty in proportion to the territories they roam over, and that such tribes are quite unfit

for the labour of clearing away primeval forests, so as, by means of fire, to transform them into grass lands. The smallness of the numbers is strikingly illustrated by the fact that, in January 1771, all the Kalmuks that had been roaming over the Steppes between the River Volga and the border of Asia escaped across that border, leaving those Steppes empty; and it is quite certain, from the records of the German colonists who arrived in those parts in 1764, that the Steppe was then as treeless as it now is.

It is also very unlikely that the subsoil of the Steppe lands is favourable to the nourishment of the roots of trees, considering that, even along watercourses, the groves planted by Mennonites and the laboriously irrigated orchards of Cossacks grow scantily, and that, for keeping fruit-gardens alive at a short distance from the Volga, incessant irrigation is necessary.

This observation raises doubts in regard to the richness of the subsoil of the Steppes. Does, indeed, the black earth, far beneath the surface, contain an abundance of organic substances? That it does not is rendered almost certain by the experience of German colonists that when the banked-up ground for potatoes is washed away by floods the land is almost without value.

Finally we cannot help noticing that the presence of salt on the surface is a common characteristic of all steppes, and that on some steppes (for instance those of the province of Astrakhan) the quantity of salt on and near the surface is still such that trees cannot possibly grow. How poor, for instance, is the result of the pains taken since 1764 by the Herrnhuters of the German colony of Sarepta, on the border of the province of Astrakhan. Higher up the River Volga, the steppes on both banks that have been turned into agricultural lands, now certainly have, on the surface, much less salt than they had in 1764, when the Germans arrived; and, even in the province of Astrakhan, enormous quantities of salt have been washed into the hundreds of lakes. This presence and washing off of salt evidently are important points for the thorough investigation of the question raised by you.

The conclusion I draw from what has above been said is that the question of the treelessness of steppes is not easy to settle, and that a thorough inquiry into it must needs be complicated. Much that is necessary for it cannot be known from existing researches.

As to the practical point of the growing of trees for timber and shade on Canadian steppe land the spontaneous spreading of trees will even, if possible, be of small advantage. Poplars and willows, the only trees that, as far as your essay shows, tend to spread, are of little value. For the systematic planting of forest trees, highly qualified men can easily, and at very moderate terms, be engaged in Russia.

My dear sir, faithfully yours,

G. M. ASHER, D.L.

Late Prof. Univ. of Heidelberg.

The Ruins in Mashonaland.

15, WALMER CRESCENT, GLASGOW.

April 17th, 1893.

SIR,—I do not agree with what Dr. Schlichter says about the ruins in Mashonaland in the April number of *The Geographical Journal*, and regard the theory which he proposes in *Petermann's Mittheilungen* as quite inapplicable to these ruins. But as I am about to revisit Mashonaland, and hope to get further information from the ruins themselves, I shall in the meantime reserve any further remarks I may have to make on Dr. Schlichter's criticism.

Yours, etc.,

ROBERT M. W. SWAN.

The Editor of *The Geographical Journal*.
No. V.—MAY, 1893.]

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1892-93.

Tenth Ordinary Meeting, March 27th, 1893.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., F.R.S., President, in the Chair.

ELECTIONS.—*Captain James Andrew Thomas Bruce, R.N.; John Buchanan, C.M.G.; Major R. B. Burnaby (East Surrey Regiment); Archibald Ewing; William Thomas Greenup; Rev. William Parr Greswell; Albert Kahn; Dr. Harold Low, M.A., &c.; John Alison McLaren; H.R.H. The Duke of Orleans; Lieut. Henry Thomas Pease, A.V.D.; Edmund Schluter; Ernest W. Smith; John Wicks; Colonel Elliott Wood, R.E., C.B.; Norman Wrigley.*

The Paper read was:—

"Do Glaciers Excavate?" By Professor T. G. Bonney, D.Sc., LL.D., F.R.S.

There was an exhibition of photographs and maps in the tea-room.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

EUROPE.

Alps—Cimone della Pala.

Wundt.

Die Besteigung des Cimone della Pala. Ein Album für Kletterer und Dolomiten-Freunde. Von Theodor Wundt. Mit 24 Lichtdrucken und zahlreichen Autotypen nach photographischen Originalen. Zweite Auflage. Stuttgart, Greiner & Pfeiffer (not dated, 1893?): oblong, pp. 72. Price 10s. 6d.

Apennines.

Cosmos 11 (1892): 129-151.

Stefani.

Le pieghe dell' Appennino fra Genova e Firenze. Contribuzione allo studio sull' origine delle montagne. Pel Prof. Carlo De Stefani.

A geological study of the northern part of the Apennine Range, with a map and numerous diagrams.

Austria—Wipphale. *Sitzungsab. Akad. Wiss. Wien* 100 (Ab. L) (1891):

Marilaun.

448-463.

Die Verschiebungen der Wasserscheide im Wipphale während der Eiszeit. Von Dr. Fritz Kerner v. Marilaun.

Geological considerations throwing light on the configuration of a district during the Ice Age, with maps.

England—Derbyshire.

Leyland.

The Peak of Derbyshire, its Scenery and Antiquities. By John Leyland, with illustrations by Alfred Dawson and Herbert Railton. London, Seeley & Co., 1891: 8vo, pp. 12 and 340. Price 7s. 6d.

A beautifully illustrated bit of local geography.

England—Essex.

Barrett.

Essex: Highways, Byways, and Waterways. Written and illustrated by O. R. B. Barrett. London, Lawrence and Bullen, 1892: sm. 4to, pp. xvi. and 228. Price 12s. 6d.

Do. do. Second Series, 1893: sm. 4to, pp. xvi. and 232. Price 12s. 6d.

The illustrations are finely executed etchings and wood engravings representing the chief architectural and other features of the county.

England, Mendip Hills.

Compton.

A Mendip Valley, its Inhabitants and Surroundings, being an enlarged and illustrated edition of Winscombe Sketches. By Theodore Compton, with original illustrations by Edward Theodore Compton, and a chapter on the geological history of the Mendips, by Prof. C. Lloyd Morgan. London, Stanford, 1892: pp. x. and 288. Price 10s. 6d.

Without being consciously a geographer the author has with a charming and sympathetic touch brought out the effects of geographical conditions upon the people and means of communication of a rural parish.

England—The Mersey.

Richards.

Report on the Present State of the Navigation of the River Mersey (1892) to the Right Honourable the Commissioners for the Conservancy of the Mersey. By Admiral Sir G. H. Richards, K.C.S., F.R.S., Acting Conservator of the Mersey. With map and appendix. London, Eyre and Spottiswoode, 1893: 8vo, pp. 20. Presented by the Commissioners.

England—Topography.

Gomme.

The Gentleman's Magazine Library: Being a classified collection of the chief contents of the Gentleman's Magazine from 1731 to 1868. Edited by George Laurence Gomme, F.R.S. English Topography [Part I.], 1891: 8vo, pp. viii. and 372. Part II. 1892: 8vo, pp. viii. and 328. Part III., 1893: 8vo, pp. xii. and 362. London, Elliot Stock.

A valuable collection of references to the topography, antiquities and general local circumstances of the English counties. Part I. deals with Bedfordshire, Berkshire, and Buckinghamshire. Part II. with Cambridgeshire, Cheshire, Cornwall, and Cumberland. Part III. with Derbyshire, Devonshire, and Dorset.

Finland.

Fennia (1892): No. 6, pp. 184.

Komitén för Revisions af Finlands Kartverk Underdåniga Betänkande.

A report with maps and summary in French of a Committee of the Finnish Parliament on the cartographical material available for maps of Finland.

France—Lorraine.

Auerbach.

B. Auerbach, Professeur de Géographie à la Faculté des Lettres de Nancy. Le Plateau Lorrain, Essai de Géographie régionale. Avec 24 croquis cartographiques de J.-V. Barbier et 21 vues photographiques. Paris, Berger-Levrault et Cie., 1893, 8vo, pp. xxiv. and 360. Price 5 fr. Presented by the Publishers.

This interesting volume, which treats local geography in an exceptionally scientific manner, will be the subject of a special review.

France—Maps.

Catalogue des cartes, plans et autres ouvrages publiés par le Service Géographique de l'Armée, 1892. Paris, Baudoin: 8vo, pp. 80, plates 11. Price 1s.

France—Montpellier. Bull. Soc. Languedocienne Geog. 15 (1892): 530-580.

Viala.

Formation Basaltique de Montpellier. Rapports de direction des fissures filoniennes avec les systèmes de montagnes. Par L. Fernand Viala.

Germany—Pinewoods.

Höck.

Nadelwaldflora norddeutschlands. Eine pflanzen-geographische Studie. Von Dr. E. Höck in Luckenwalde. Mit einer Karte. Stuttgart Engelhorn, 1893: 8vo, pp. 56. Price 3 m.

Part 4 of Vol. VII. of Kirchhoff's *Forschungen zur deutschen Landes- und Volkskunde*.

Greece—Ithaca.

Seillière.

Ernest Seillière. Une Excursion à Ithaque. Dessins de Pierre Vignal d'après les photographies de l'auteur. Paris, Allison et Cie., 1892: 4to. pp. 76. Many illustrations. Price 15s.

A sumptuous edition of the journal of a tour in Ithaca, with fine illustrations.

- Hungary—Szegedin.** *Bul. Soc. Hongroise Geog. (Ab.)* 20 (1892): 91-107. **Hajagos.**
Die Einnündung der Maros in die Tisza. Von Emmerich Hajagos.

Abstract of a Hungarian paper on the confluence of the rivers Maros and Theiss, with an account of the present state of works for protecting the town of Szegedin from inundation. Of considerable interest as describing the process of deposition of solid matter from very slowly moving bodies of water, observed under perhaps the most favourable conditions known.

- Montenegro.** *Zeitsch. deutsch.-österreich. Alpenvereins* 23 (1892): 124-170. **Hassert.**
Der Durmitor. Wanderungen im montenegrinischen Hochgebirge. Von Dr. Kurt Hassert.

- Russia—Karelia.** *Fennia* (1892): 7 No. 2, pp. 128. **Rosberg.**
Ytbildningar i ryska och finska Karelän med särskild hänsyn till de karelska rand-moränerna. Af J. E. Rosberg.

An account with maps, sections and views and German summary, of the great terminal moraine which stretches from Vilmastrand northward to the White Sea.

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The following names, more or less connected with geography and travel, appear among the notices in the present volume:—William Kennett Loftus, by G. S. Boulger; James Richardson Logan, by T. Seecombe; Michael Lok, by Prof. J. K. Laughton; Percival Barton Lord, by Gordon Goodwin; William Keast Lord, by H. M. Chichester; Louis Arthur Lucas, by Gordon Goodwin; William Lucas, by H. M. Chichester; Alfred Lyall, by the same; Robert Lyall, by Capt. S. P. Oliver; Sir Charles Lyell, by Prof. Grenville A. J. Cole; Henry Blossie Lynch, by H. M. Chichester; Thomas Kerr Lynch, by the same; and George Francis Lyon, by Prof. J. K. Laughton.

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Sur la cause des variations périodiques des latitudes terrestres, par Hugo Gylden.

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Production and Distribution of the Principal Agricultural Products of the World. Compiled from official statistics U.S. Department of Agriculture. Division of Statistics. Miscellaneous Series, No. 5. Washington, 1893: 8vo, pp. 206.

This work compiled under the special charge of Mr. B. W. Snow is of very special value in presenting the agricultural statistics for ten consecutive years of ninety-two countries or colonies reduced to the same units and arranged in an orderly manner.

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Address of Mr. Harrison Hayter, President, on assuming the chair for the first time after his election. With map of Euphrates Valley Railway.

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- Udānavarga.** Rockhill.
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Indian Government Surveys.

Surveyor-General of India.

Indian Atlas, 4 miles to an inch. Sheet No. 94, Parts of Districts Khamet (Nizam's Dominions), of Kistna, Godavari and Vizagapatam (Madras Presidency) and Bastar State (Central Provinces). Quarter Sheets No. 35, S.W. Parts of Native States, Oodeypore, Dungarpur, Banswara and Partabgarh (Rajputana), and of Mahi Kautha Agency (Bombay Presidency). No. 114, S.W. Parts of Districts Singhbhum; Bonai (Tributary State, Chota Nagpur), Keonjhar and Mayurbhanja (Tributary States, Orissa).—India, showing railways, corrected up to March 31st, 1892, 1 inch to 96 miles.—India, showing telegraphs, corrected up to March 31st, 1892, 1 inch to 96 miles. Punjab Survey, 1 inch to a mile. Sheet No. 117, Districts Jhang and Dera Ismail Khan. Seasons 1879 to 81 and 1888–89. Sheet No. 234, Kapurthala State. Seasons 1885–86. Sheet No. 236, Districts Jullundur and Ferozepore, and Kapurthala State. Seasons 1884 to 87. Sheet No. 254, District Ludhiana and Sikh States. Seasons 1887–88 and 1890–91. Sheet No. 255, District Karnal, and Sikh States. Seasons 1887–88 and 1888 to 90. Sheet No. 294. (2nd edition), Districts Umballa and Karnal. Seasons 1870–72 and 1887–88.—Bombay Survey, 1 inch to a mile. Sheet No. 330, District Bijapur. Seasons 1889–91.—Lower Burma Survey, 1 inch to a mile. Sheet No. 567 and portion of No. 583, District Mergui. Seasons 1889–91. Sheet No. 568 and portion of No. 584, District Mergui. Seasons 1889–91.—Upper Burma Survey. Portion of Coalfield's Tract, Upper Chindwin District. Surveyed, Season 1891–92, 1 inch to a mile.—North Eastern Frontier, 1 inch to 8 miles. Sheet No. 15 (2nd edition). Parts of Districts Sylhet, Cachar Khasi Hills, Jaintia Hills and Naga Hills (Assam), and Upper Chindwin (Burma), of Native States Manipur (Assam), Hill Tipperah (Bengal) and of Lushai Hills.—South Eastern Frontier, 1 inch to 4 miles. Sheet No. 1 N.W. (2nd edition). Parts of Chittagong Hill Tracts, Hill Tipperah (Bengal), Lushai and Chin Hills. Map of the Gorakhpur Division, prepared in accordance with Government N.W.P., P.W. Department. Circular No. E, dated May 16th, 1872. Brought up to December 31st, 1891, 1 inch to 4 miles. 2 Sheets.—Map of Kamoun Division, prepared in accordance with Government N.W.P., P.W. Department. Circular No. E, dated May 16th, 1872, revised up to January 1891, 1 inch to 4 miles. 4 Sheets.—Map of the Rohilkhand Division, prepared in accordance with Government N.W.P., P.W. Department. Circular No. E, dated May 16th, 1872, revised up to January, 1891, 1 inch to 4 miles, 4 sheets.—District Benares, 1882–84, published May 1892. 3 Sheets, 1 inch to 2 miles.—District Basti 1883–88, 1 inch to 2 miles, published June 1892. 4 sheets.—District Sylhet, 1 inch to 4 miles. With additions and corrections up to October 1891.—Parts of Jeypore, Jodhpore, Kishengurh and Tonk States, 1 inch to 4 miles. No. IV, Degree Sheet, Rajputana Survey, February 1870, with addition of railway up to March 1892.—Chart of Triangulation embracing the field of operations of the Lushai Column.—Lushai Expeditionary Force, 1889–90, 1 inch to 4 miles.—No. 2, Preliminary Chart of the Principal Triangulation of the Mandalay Series. Season 1891–92, 1 inch to 4 miles. *Presented by H.M. Secretary of State for India, through India Office.*

Japan.

Supan.

Verteilung der Erdbeben in Japan, 1885-1889. Von Alexander Supan, Verbreitung der Erdbeben, 1885-1889. Verbreitung der Starken Erdbeben, 1885-1889. *Petermann's Geographische Mittheilungen*. Jahrgang 1893. Tafel 2. Gotha, Justus Perthes. Presented by the Publisher.

AFRICA.

Algeria.

Service Géographique de l'Armée, Paris.

Carte topographique de l'Algérie. Scale 1:50,000, or 1·4 inches to a geographical mile. Service Géographique de l'Armée, Paris. Sheets:—No. 27, Taza; No. 80, Oued Kramis; No. 209, Aine Temouchent. Price 1 fr. 50 cents. each sheet.

Angola.

Commissão de Cartographia, Lisbon.

Carta de Angola, 1892. Scale 1:3,000,000, or 41·6 geographical miles to an inch. Commissão de Cartographia, Lisbon. Presented by the Commissão de Cartographia.

Great care has evidently been taken in the preparation of this map to bring it up to date. The railways in operation, and proposed, are shown; the heights of many places are given in metres, and the importance of towns and villages is indicated by symbols. In one corner of the map there is a table of the administrative divisions of the province, and of the districts into which each of them is again divided.

AMERICA.

Ecuador.

Wolf.

Carta Geográfica del Ecuador por Dr. Teodoro Wolf, publicada por orden del Supremo Gobierno de la República y trabajada bajo las Presidencias de los E. E. Señores, Dr. D. J. M. Plácido Caamaño y Dr. D. Antonio Flores. 1892. Instituto geográfico de H. Wagner y E. Debes en Leipzig. Scale 1:445,000, or 6·2 geographical miles to an inch.

The absence of any reliable map of Ecuador has been greatly felt, and as Dr. Wolf has been twenty years in the country, and has used (with the exception of Mr. E. Whymper's work) all the reliable material obtainable, there is every reason to believe that the map he has produced is as accurate as can be expected, the country never having been properly surveyed. As regards the western portion of the republic, a very large amount of detail is given, while the eastern part is shown on an inset with a reduced scale. Among the authorities consulted by Dr. Wolf are Velasco, Humboldt, British Admiralty Charts, Wisse, Witt, Wilson, Reiss and Stübel, Codazzi, Raimondi and others. In one corner of the map a table is given containing the altitudes of mountains, cities, &c., above sea-level. These for the most part are taken from the lists of Reiss and Stübel. There is a considerable difference between some altitudes given on this map and the result of Mr. E. Whymper's observations; this is to be regretted, as no explorer has taken more pains to arrive at the truth, or, indeed, has been more competent to do so.

The map has been produced by Wagner and Debes of Leipzig in a very creditable manner. The hill-shading is in brown and the water in blue; and taken altogether, it is a very effective map. The Galapagos Group is shown on an inset, and a table of the territorial divisions of the Republic is given.

Accompanying the map is a work on the physical geography and geology of Ecuador.

United States.

Appalachian Mountain Club.

Map of New England and Eastern New York, showing the position of such Prominent Summits of the several Regions as have been accurately located and published. Scale 1:1,000,000, or 13·6 geographical miles to an inch. From *Appalachia*, vol. vii., No. 1, February, 1893. Boston, Appalachian Mountain Club.

AUSTRALASIA.

Australasia.

Behr.

Neueste Karte von Australien. Mit Neu-Guinea, Kaiser-Wilhelms-Land, Bismarck-Archipel, den Sunda-Inseln, Siam und Annam, Neu Seeland

und sämtlichen Inselgruppen des Grossen Oceans, nebst den Dampfer- und Telegraphen-Verbindungen und einem orographischen Kärtchen. Für die Bedürfnisse des Handels und der Verkehrsanstalten sowie für den Unterricht an Lehranstalten bearbeitet von Prof. Fr. Behr. Scale 1:12,500,000, or 171·2 geographical miles to an inch. Stuttgart, Verlag von Julius Maier, Separat Konto Fr. Doerr.

Australia.**Lindsay.**

Map showing the Explorations and Discoveries in South Australia and Western Australia, made by the Elder Scientific Exploring Expedition, originated and equipped by Sir Thomas Elder, G.C.M.G., F.R.G.S., under the auspices of the South Australian and Victorian branches of the Royal Geographical Society of Australasia, commanded by David Lindsay, F.R.G.S., Memb. S. A. I. Surv., 1891-2. Compiled and drawn by D. Lindsay and L. A. Wells. Scale 1:975,000, or 13·3 geographical miles to an inch. Surveyor-General's Office, Adelaide. Presented by Sir Thomas Elder, G.C.M.G., F.R.G.S.

GENERAL.**German Colonies.****Langhans.**

Deutscher Kolonial-Atlas, 30 Karten mit vielen Hundert Nebenkarten entworfen, bearbeitet und herausgegeben von Paul Langhans. Zweite Lieferung: Nr. 4, Das Deutsche Land. Nr. 24, Schutzgebiet der Neu Guinea-Kompanie, Blatt 1. Dritte Lieferung: Nr. 27, Schutzgebiet der Neu Guinea-Kompanie, Blatt 4. Nr. 29, Schutzgebiet der Neu Guinea-Kompanie, Blatt 6. Gotha: Justus Perthes, 1893. Price 1 m. 60 pf. each part.

These are the second and third issues of an atlas of the German colonies, the first part of which was noticed in the January number of *The Geographical Journal*. The maps have been carefully brought up to date, and are very nicely drawn.

Meteorological.**Zenker.**

Die Jahrestemperaturen der Luft über den Océanen und Binnenmeeren in ihren Abweichungen von den Formel: $\vartheta = L - 30^\circ \text{C}$. Von Dr. W. Zenker. *Petermann's Geographische Mitteilungen*, 1893. Tafel 4. Gotha, Justus Perthes. Presented by the Publisher.

The World.**Johnston.**

W. & A. K. Johnston's Royal Atlas of Modern Geography. Edition in monthly parts. Part 17. W. & A. K. Johnston, Edinburgh and London, 1893. Price 4s. 6d. each part. Presented by the Publishers.

This part contains a map of Palestine, reduced by arrangement with the Committee of the Palestine Exploration Fund, and embodying as much of Western and Eastern Palestine as the scale on which it is drawn allows; an inset plan of Jerusalem is also given. The other is the south-east sheet of a four-sheet map of the United States, with inset plans of New York and its environs, and the City of Washington.

The World.**Andree.**

Richard Andree's Allgemeiner Handatlas in hundertvierzig Kartenseiten, nebst alphabetischen Namensverzeichnis. Dritte völlig neu bearbeitete, stark vermehrte Auflage, herausgegeben von der Geographischen Anstalt von Velhagen und Klasing in Leipzig. Parts 1 to 27. Price 50 pf. each.

These form part of the third German edition of this atlas, which, when complete, will contain 140 sheets of maps. It is the intention of the publishers to issue the numbers at intervals of from eight to fourteen days, by which means the complete atlas will be in the hands of subscribers before the end of the present year. In the prospectus, that accompanies the present issues, it is stated that nearly half of the maps will be entirely new, and all of them with reference to Germany will be drawn on a uniform scale.

The World.**Cassell.**

The Universal Atlas, containing 117 pages of Maps, and an Alphabetical Index of 125,000 Names. Published for the Atlas Publishing Co., Limited, by Cassell & Co., Limited. London, 1893. Price £1 10s.

This atlas is now complete.

The World.

Vidal-Lablache.

Atlas Vidal-Lablache, Maitre de Conférences de Géographe à l'École Normale Supérieure. Histoire et Géographie. 137 Cartes—248 Cartons. — Index alphabétique de plus de 40,000 noms. (L'Atlas complet paraîtra en 24 livraisons.) 19^e Livraison. Paris: Armand Colin & Cie., Editeurs. 1893. Price 1 fr. 25 cents each part.

The present issue of this atlas contains maps of South America; the conquests of Russia, during the present century in Central Asia; French conquests in Algeria; Africa in 1870, showing the territory which has come within the spheres of influence of Europeans since that date; Australia, on a very small scale; North and South polar maps; The World in hemispheres orographically coloured; a set of maps showing the zones of vegetation, principal races, and religions of the world; currents and climates; Western Asia; Eastern Asia. As usual with this atlas, explanatory notes are given with each map.

CHARTS.

Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty. January and February, 1893. *Presented by the Hydrographic Department, Admiralty.*

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(J. D. Potter, Agent.)

instances from the Alps, though other glaciated regions are not unknown to me, because that mountain chain is sure to be familiar to my audience, and is the one which I know the best.

It may be well to call attention at the outset to the fact that lakes—as all admit—may be formed in various ways. After the removal of subterranean masses of soluble salts, the surface of the ground may subside, and the local lowering of the bed of a stream may cause its waters to overflow and form a mere. This often happens in Cheshire and Worcestershire, owing to the extensive pumping of brine. Such lakes, however, are usually small, and, so far as I know, are always shallow. Again, a stream may be blocked either by a berg-fall, or by the terminal moraine of a glacier, or even by the drift which a tributary has swept down. The first of these produced the Lago d'Alleghe: the second the Mattmark See: by the third the level of many Alpine lakes, whatever be their origin, has been raised. Of the lakes, however, which actually occupy rock-basins, not a few are contained in old craters; doubtless, most of these are comparatively small; still some are not; for instance, the Lago de Bolsena, the area of which is only exceeded by that of the largest Alpine lakes. As regards these, the level of their waters, at least in several instances, is raised by masses of drift, brought down from other drainage areas by important tributaries, which has obstructed the course of the main river.* This, however, is a detail. I admit that most, if not all the great Alpine lakes, as well as the tiny tarns high up in the mountain fastnesses, occupy true rock basins, which in the case of the former, as well as in that of the latter, are attributed by the school of Ramsay to the erosive action of glaciers.

The paper, already mentioned, began with a discussion of certain earlier hypotheses, in the course of which it was proved, conclusively as I think, that the rock-basins of the Alpine lakes could not have been produced by any kind of local subsidence, or by fissures in the Earth's crust or by the erosive action of the rivers themselves. It was pointed out that they were abundant in regions which had been formerly occupied by glaciers, and it was urged that ice could erode and scoop. So, as no other hypothesis remained as a competitor, its advocates claimed a verdict in its favour.

Two weak points in this argument at once suggest themselves to careful and somewhat sceptical readers of Sir A. Ramsay's paper. The first one, why the lakes are so few and occur so low down in the valleys, is indeed noticed, but is met only by two or three vague generalities of little argumentative value. The second, and more grave one, is that a mode

* Thus the first outcrop of solid rock in the bed of the Rhone to the east of Geneva is about 34 feet below the level of that lake, and in the bed of the Rhine, so far as I know, about 25 feet below the level of Constance. It must be remembered that a lake once formed regulates the velocity of the principal stream, while the tributary can be greatly swollen. That is the case with the Rhone and the Arve below Geneva.

of forming a series of lake basins which brings them into close connection with processes of mountain-making, has been entirely overlooked. Subsequent attempts to strengthen Sir A. Ramsay's argument have been directed rather to supplying the deficiencies in the former case, than to dealing destructively with the latter difficulty, and later defenders of his hypothesis have apparently deemed silence on this topic more prudent than speech.

The discussion then as to the erosive power of glaciers may be subdivided into three propositions. These are the following:

- (1) Lakes are abundant in glaciated regions;
- (2) Glaciers are potent excavating agents;
- (3) No agent but ice is competent to produce a lake basin.

The first may be briefly dismissed, for I do not dispute its truth. Lakes occupying true rock basins, so far as I know, are commoner in glaciated regions than in any other. At first sight this may seem like surrendering the key of the position. But the concession does not amount to very much; for the tarns of Cumberland, Wales, and the Highlands merge almost insensibly into such lakelets as Windermere and Derwentwater, Bala and Llanberis, Katrine and Lomond, and these again into Zug and Orta, Thun and Brienz, Zurich and Lucerne, Como and Geneva, in a word, into all the Alpine lakes. From these, however, we are led, step by step, to the great lakes of North America, and to those which feed the Nile, the Congo and the Zambesi in Africa. But no one, so far as I am aware, regards these lakes as the results of glacial erosion, or attributes to this either the Dead Sea or Lake Van, either the Aral or the Caspian. But such inland basins seem closely related to those of the Sea of Marmora and the Euxine, and these are hardly separable from the basins of the Mediterranean and of the outer oceans. Obviously then, if some rock-basins have been excavated by ice, dimples also exist on the Earth's face, which are due to other causes, and the concession still leaves individual cases open to discussion.

For the present then let us pass on. As to the second proposition, that glaciers are potent excavating agents, it may be well to remark at the outset that *abrasion* and *excavation* are not identical terms, and that it is not enough to prove the existence of the former in order to establish the latter. How a glacier works must be ascertained by studying the contours of its bed; these can be most readily examined in districts from which the ice has disappeared so recently (geologically speaking) that its foot-marks are still fresh. For this purpose, the higher valleys in the Alps are preferable to the mountain regions of our own island, not only because all the features are on a grander scale, but also because there is no important difference of opinion as to the extent of the glaciers and no complications are introduced into the problem by the possibility of a submergence.

But before examining the effects of ice in the Alps an objection

which has been sometimes advanced must be discussed. When an enthusiastic glacialist is pressed hard by evidence gathered from the Alps, he retorts, "These glaciers are poor, shrivelled affairs. No inferences can be safely drawn from them as to the conditions prevalent in a region enveloped in ice-sheets like those of Greenland." The objection, so far as it applies to the existing glaciers, is not without some justice. The phenomena of the Gross Aletsch Glacier will differ from those of the Jakobshavn Glacier as the phenomena of the Thames differ from those of the Amazon; but it will be after all a difference in degree rather than in kind. The objection, however, becomes less and less applicable as we proceed to examine Alpine valleys some distance away from the existing glaciers. When ice occupied every glen in the Alps; when the confluent sheets welled up against the flanks of the Jura several hundred feet above the level of the present lakes of Neuchatel and Bienne, then the condition of Switzerland was fairly comparable with that of Greenland at the present day. Hence the valleys of the Alps should exhibit the contours of a region from which an ice-sheet has vanished; in any case they must bear the marks of ice-streams which, according to the hypothesis in question, were competent to dig out the Alpine and Sub-alpine lakes. Unless it can be shown that the contours of a valley, down which the course of a glacier can be tracked, differ markedly in its several parts, the Alps furnish us with examples of the action of large ice-streams no less than of small glaciers. But the difference, if any, is never more than one of degree. My experience of the Alps is extensive and of long standing, and I make this statement confidently and without reservation.

Rocks worn by glaciers should testify to the action of a scooping tool, and any valley materially deepened by such a substance as ice (a more or less plastic solid) should exhibit a section bearing some resemblance to the letter U. Let us compare the contours of a region such as Sinai, where glaciers, if ever present, must have been always unimportant features, with those of the Alps. Between the peaks of the one and the aiguilles, or ridges, high above the ice-fields in the other, there is no marked difference—nay, I will go so far as to say that the differences in outline presented by mountain ridges out of the reach of glaciers, whatever may be the cause, depend much more upon the character of the rock than upon altitude above sea-level or the temperature of the region. Frost no doubt is more destructive than heat, but the dominant outlines are alike in climates warm or cold. Place before a geologist a series of photographs of Sinai, the Alps, the Caucasus, the Himalayas, the Lofoten Islands, or New Zealand, and if a little snow be introduced into some, and vegetation carefully concealed in all, he will be unable to determine the locality if he is not aided by actual knowledge of the views. To speak only of gneisses and harder crystalline schists: jagged, splintered, and toothed ridges stand out against the sky, sharp-edged

buttresses, grooved by fissures, furrowed by ravines, broken by precipices, descend towards the valleys. Wherever the ice has not left its mark, there, whether the ranges be high or low, whether the crags overshadow tropical ferns or Alpine pines, the features which are sculptured by meteoric influences other than glaciers are substantially the same.

What contours then are exhibited in those parts of the valleys which have been once overflowed by glaciers? The Alps are well adapted for answering this question. This is the sum of their evidence: toothed prominences have been broken or rubbed away, the rough places have been made smooth, the rugged hill has been reduced to rounded slopes



ROCKY HEADLAND WORN BY ANCIENT GLACIERS OF THE AAR AT THE GRIMSEL HOSPICE, SWITZERLAND.

of rock "like the backs of plunging dolphins." But the crag remains a crag, the buttress a buttress, and the hill a hill; the valley also does not alter its leading outlines, the V-like section so characteristic of ordinary fluvial erosion still remains; all that the ice has done has been to act like a gigantic rasp; it has modified not revolutionised, it has moulded, not regenerated. No sooner do we come to study in detail the effects of the ancient glaciers in the upper valleys of the Alps than we are struck by their apparent inefficiency as erosive agents. Here, where the ice has lingered longest, just beneath the actual glacier, we see that a cliff

continues to exist. Again and again in a valley we may find that on the lee side of prominences crags still remain, sometimes in sufficient frequency to be marked features in the scenery. Let us take as an example a single valley—the Haslithal. The long level delta of the Lake of Brienz extends to a little above Meiringen, there the valley is barred by a craggy ridge, which is cleft by the Aarschlucht. This chasm has been sawn by the subglacial torrent, while the ice itself has moulded every rock on the barrier into billowy undulations. From its crest we look down, upon a level meadow, which extends to the junction of the Gadmenthal with the Haslithal. This grassy basin might well be claimed as an instance of glacial erosion—by which indeed it possibly may have been deepened; but if we attribute to this agency the removal of all the rock between the summit level of the barrier and the present meadow-floor, how are we to explain the existence of the steep rocky slope down which the road to Imhof descends in zigzags. The slopes, in the teeth of an advancing glacier, are always comparatively gentle, and very unlike those which are presented by this rocky rib. Again, after the comparatively uncharacteristic slopes which continue for some distance above Guttannen have been left behind, the region of hard crystalline rocks is entered which extends not only to the Grimsel pass but also into the heart of the great Oberland peaks. What contours does this possess? Everywhere, no doubt, ice-worn rocks meet the eye; curving slopes extending far above the valley floor, spurs and ridges, which are now one vast group of *roches moutonnées*; but hardly ever the faintest approach to a trough-like section; instead of this the normal V-like outline characteristic of the action of heat and cold, of rain and snow. Perhaps no district in the Alps exhibits the traces of ice-action on a grander scale, yet these have been only superimposed upon and modify the features of fluvial erosion. Yet the contours of ice-action and in some cases the very striae can be traced almost down to the surface of the torrents. But the Haslithal is not at all an exceptional case. I have examined almost every important valley which leads up into one of the greater groups of crystalline peaks in the Alps, with the same result—namely, that the major features, whether in crag, rock, slope, or ridge, are those of the ordinary processes of meteoric and fluvial erosion, the minor only being due to glacial action. Hence it follows that, when the ice first emerged from the fastnesses of the central peaks, it descended valleys corresponding in their main outlines with those which still exist, say nearly identical in depth and breadth; but at that time every crag was rough, every ridge was sharp or serrate. The ice took possession of the region. It rasped and rubbed, and, when it finally disappeared, the rock surfaces exposed were worn and defaced, like the sculpture of some bas-relief which has been trodden underfoot till only the main outlines of its design can be distinguished. The Val Bregaglia, the Val Mastalone, Val Anzasca, the Valley of the Dranse

and many others have afforded me the clearest proofs that the ice has occupied without materially deepening, excavating, or modifying the glens. Crags which as it advanced must have risen up like peel-towers from the floor of the valley have been buried deep below the frozen mass, and have emerged, worn, rounded, scored, but only so far changed as to have become humps.

The same is true of the limestone regions; but here the valleys as a rule are rather more troughlike in outline, and the results of ice action are more often blurred or removed by subsequent disintegration, so that these districts are less suited for examination.

But surely there are tarns in the Alps? Yes; though if we restrict ourselves to those which unquestionably occupy rock basins, they are not very numerous. Probably they would become relatively more abundant if the glaciers wholly disappeared from the Alps. But these rock-basins commonly occur, as in the more mountainous districts of our own islands, either in corries, that is, at the foot of precipices or steep rock slopes, or else at the back of low ridges of rock by which the valley is almost barred. In these two situations a semi-solid substance like glacier-ice might put forth considerable erosive power—in the one case owing to the sudden change in the inclination of the bed, in the other from a similar cause which acted, so to say, in the contrary direction; for here the ice is forced uphill by the pressure of the masses advancing from behind.

Now, in 1893, after nine more visits to the Alps—not to mention other mountain regions—during which these problems have never been absent from my mind, I repeat the statement made in 1874, that the Alpine “valleys appear to be much older than the Ice age, and to have been but little modified during the period of maximum extension of the glaciers.”

I pass on to another question. Does an examination of existing glaciers suggest that as a rule they have much erosive power? An answer to the enquiry may be sought both on the ground from which a glacier has recently retreated, and on that where it is beginning to encroach. But, as bearing on this point, I will for once quote what I have not seen. The Muir Glacier in Alaska is surely big enough to do a little erosion on its own account. It is 25 to 30 miles long. It is now, however, smaller than formerly, and in retreating has exposed a mass of gravel over which, according to Dr. Wright, it has once flowed. This does not indeed lie in the path of the main stream, but still some erosion might be expected. The stems of dead trees are still upright, rooted in the soil in which they formerly grew. The ice then has passed over this gravel without disturbing it, and the glacier can be seen in other places still resting on a similar gravel.* The glaciers of Greenland, according to Mr. Whymper, leave uncovered in their retreat

* Wright, ‘The Ice Age in North America,’ chap. iii.

level surfaces, without any sign of basins, and inequalities in the hardness of the rock masses produce little or no effect upon the surfaces worn by the ice.*

In the Alps about the year 1860 the glaciers began to dwindle. By 1870 considerable tracts of bare rock or *débris* were exposed, which a dozen years before had been buried under the ice. On none of these have I seen any basin-like hollow or sign of excavation as distinguished from abrasion. The Unter Grindelwald Glacier in the last stage of its descent passes over three or four rocky terraces. The angles of these are not very seriously worn away, nor are hollows excavated at the base of the steps. The bed of the Argentière Glacier (I made my way some little distance under the ice) was rather unequal, and was less uniformly abraded than I had expected. "There were no signs whatever of the glacier being able to break off or root up blocks of the subjacent schistose rock: it seemed simply to wear away prominences." This also is true of other glaciers.

But prior to 1860, and again in 1891, I saw glaciers which were advancing. What did these accomplish? They ploughed up the turf of a meadow for a foot or two in depth; they pushed moraine-stuff in front of them, showing some tendency to override it, and nothing more. But further testimony may be obtained in respect to this enquiry by examining ground from which glaciers have recently retreated. In 1875, at the foot both of the Glacier des Bois and of the Argentière Glacier, was a stony plain. Both these proved to have been recently uncovered by the ice; in other words, the glacier had not been able to plough up a boulder-bed even at a place where, owing to the change of level, some erosive action not unreasonably might have been expected. But, further, on both these plains big blocks of protogine were lying.† These were striated on sides and top, thus showing that the ice had actually flowed over them, as if it were a stream of mud. Here, however, we might be reminded of the insignificance of the Alpine glaciers. Permit me then to point out that these localities must have been buried beneath ice when a glacier covered the area of the Lake of Geneva, and must have continued to be buried for centuries and centuries after the ice had melted away from every lake-basin in Switzerland or Italy. But it may be urged that in the glacial epoch this district was covered by *névé*, and that *névé* does not excavate. Speaking for myself, I think its erosive power is small; but, if so, there will be a schism in the ranks of glacial erosionists, for then glaciers cannot have excavated cirques, and to admit this would entail unpleasant consequences; so I

* 'Scrambles in the Alps,' chap. vi.

† One in front of the Glacier des Bois was 12 by 8 by 4 yards; the largest before the Argentière Glacier was 12 by 7 by 5 yards. I think it very probable that these larger blocks at any rate were dropped at a late period in the history of the glacier, and are only temporarily overflowed by ice.

content myself by observing that *névé* would cease to occupy a district barely 4000 feet above the sea some time before the glaciers could be called insignificant. So far then as the evidence goes which I can collect from the Alps, and, I may add, from all that I have seen in Britain, the Pyrenees, Norway and Canada, the lakes which are due to glacial erosion (*i.e.* removing all dams of moraine or drift) are rather local, small, and shallow.

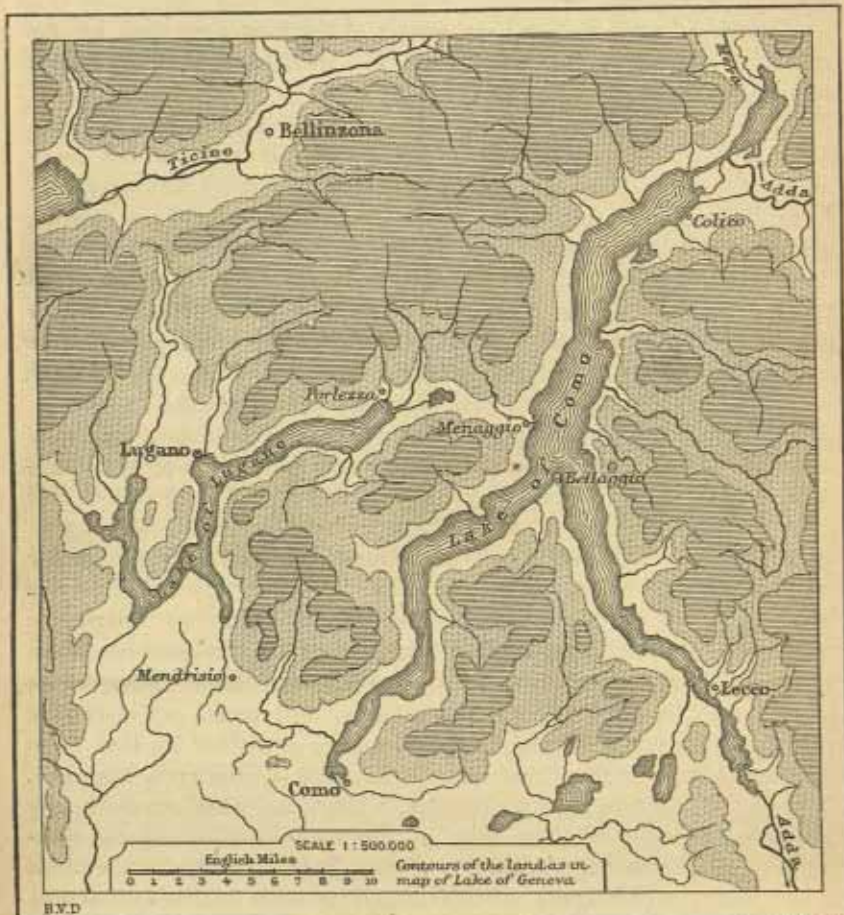
I pass on now to consider certain difficulties presented by the greater Alpine lakes when we attempt to attribute them to the erosive action of glaciers.

First, in regard to their position: some of them, such as Constance, Geneva, Como, Maggiore, &c., are comparatively near to the lower limits of the great ice sheets, and so would be covered for a relatively short time. All of them are many miles from the ends of the existing glaciers, yet we are asked to admit that a rock basin, in depth sometimes exceeding 1000 feet and generally more than 500, has been scooped out in a time much shorter than that which has proved insufficient for the obliteration of the original features of the upper valleys or for the deepening of their beds by more than a few yards at most—indeed, as a rule, the ice seems never to have been able to overtake the torrent.

Perhaps it may be answered that a stream of ice like a stream of water has not the same erosive force in every part of its course. Probably that is true; but we may fairly decline to take account of this general statement until we are informed what there is in the physiography of each lake region to account for the quickening of a glacier from an inert to an energetic condition. We find no marked change in the level of the ground, no remarkable confluence of valleys, no conspicuous straits through which the crowded ice-streams were forced by the relentless pressure of the masses behind. Surely Como cannot be accounted for by the slight descent from Chiavenna, or Geneva by that from the rocky barrier of St. Maurice, or Brienz by that from the Aarschlucht, while Constance, Zurich, and Wallenstadt, Maggiore, Orta, and Garda, are hopeless puzzles? Moreover, what are we to say of the Achensee, that deep lake, so strangely nestling among comparatively low limestone peaks; or of Zug, half sheltered by the block of the Rigi; or of Lugano, with its radiating arms enclosed on almost every side by mountains comparatively low?

Let us turn to another group of facts. The general outline of certain of the larger Alpine lakes, such as Constance, Zurich, Geneva, and Garda, at first sight is not unfavourable to the idea that they have been excavated by a glacier, but serious difficulties are presented on closer examination. The water from a considerable extent of the south side of the central range in Tyrol passes away down the valley of the Adige; during the glacial epoch the ice must have followed the same path. Yet no lake records the fact, and if one ever existed it must

have been small and shallow. The Lake of Garda lies, no doubt, in the path of a glacier, but this drained an area comparatively restricted, occupied by mountains far from lofty. The crags and headlands in the middle part of the lake are curiously unlike, in their general outlines, what might be expected as the ruins left in the track of a gigantic scoop which has dug out a basin, in one place full 900 feet



LAKES OF LUGANO AND COMO.

F.S. Waller

deep. Geneva also does not lie in the path of the thickest part of the ancient glacier, but as it curves round towards the south it follows a line along which the scooping force must have been comparatively slight. As will be presently seen this initial difficulty is strengthened by a closer study of the form of its bed. Again, how are the radiating arms of Lugano and Lucerne to be explained? Supposing the orographic features of these districts in each case to be first outlined and the

valleys excavated down to the present water level, what is there in the structure of either to explain the scooping out of lateral valleys? If the recurved hook and lateral bays of Lugano are the memorials of as many ice streams, it may be fairly asked why almost every transverse tributary valley in the Alps is not also provided with a lake? In the case of Lucerne how was the Küssnacht arm of the lake produced? Did a glacier plunge headlong down the little slope made famous by the legend of the "hollow way," or did the ice stream either from the Brünig Pass or from the Engelberger Thal crawl across the back of the glacier of the Reuss Thal, like one snake over another, and then compensate itself for this feat by excavation? Perhaps such an intertwining of ice streams would not be too great a trial for the faith of some glacialists, but speaking for myself, I should like to be supplied with a few corroborative facts before removing it from the imaginative poetry to the sober prose of science.

But the Lake of Como is even more perplexing, if regarded as an instance of glacial erosion. Its subaqueous contours present serious difficulties; but for the moment only those which meet the eye shall be noticed. The lake in form roughly resembles the letter Y, its base pointing to the mountains. The water flows out of the eastern, or Lecco, arm; the western, or Como, arm is closed by a line of sandstone hills (molasse), which rise a few hundred feet above the level of the water. The original lake basin extended nearly up to Chiavenna; its present length, measured to Como, is about 31 miles, and to Lecco about 24 miles. The deepest part of the lake is 1341 feet—642 feet below sea-level. Chiavenna is only about 350 feet above the lake, and the valleys tributary to the Maira do not descend from very high mountains, since those draining the principal peaks of the Bernina group enter the Val Telline; and the junction of that huge tributary produces no appreciable effect in widening the main valley. Thus we are justified in asking how it was that the ice suddenly acquired this erosive force, after having been previously such an inefficient excavator. Again, if it be assumed that the valley was carved out by ordinary agencies nearly to the present lake-level—for without this assumption I cannot account for the existence of the promontory of Bellagio, and the severance of the ancient glacier into two forks—let us proceed to examine the western, or Como, ice-stream. It passed over the site of the town; it climbed the slopes beyond, for their beds of conglomerate are smoothed and striated; it crossed the sandstone ridge, leaving blocks of granite from near the Forno and Albigna glaciers poised on its crest, and piling up moraines on the lowland some distance away to the south. How, then, has this projecting barrier of comparatively soft sandstone escaped from being planed flat by the ice which was so potent an agent as to dig out the long basin to the north? So little has it suffered, that its crest is a ridge, unusually narrow and sharp, often only a few feet, hardly ever a

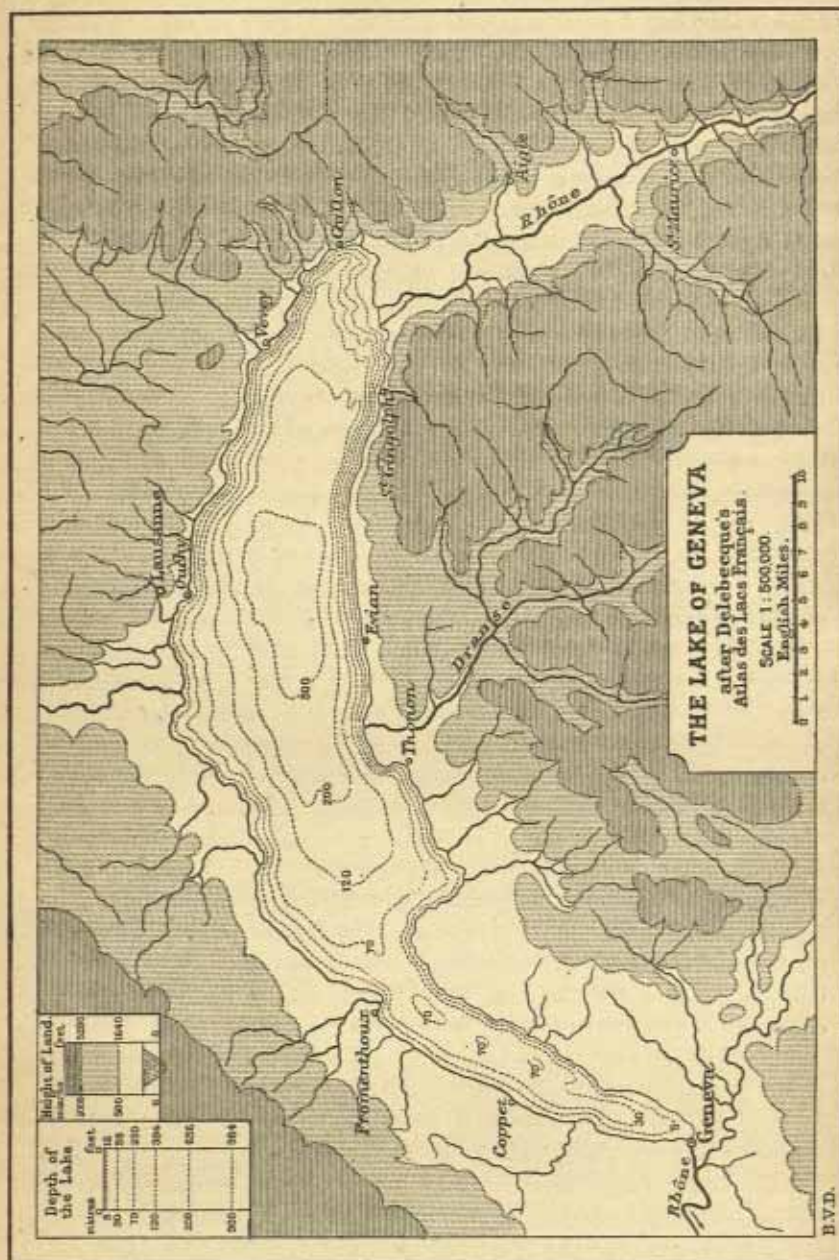
few yards, across, with steep slopes on either side. The lower end of the Lake of Orta, from the northern part of which water is discharged to the Lago Maggiore, affords a similar and no less puzzling problem. Not less perplexing are the subaqueous contours of the Lake of Como. The arm ending at that town is deeper than the upper lake, its bed for a considerable distance being about 1300 feet below the surface; while the basin north of Bellaggio, with a maximum of 1116 feet, is less than 1000 feet deep as a rule. But nearly opposite to Bellaggio, just below the point of division of the ancient glacier, and where we should suppose its erosive force to be still very great, the bed of the lake rises to within 438 feet of the surface. The basin of the Lecco arm, however, is shallower than that of the upper lake.

The subaqueous contours of the Lake of Geneva, recently described in Professor Forel's monograph,* do not lend themselves very readily to any theory of glacial excavation. As a physical feature it is later than the middle of the miocene period. Its slopes, and almost certainly its bed, are covered with glacial *débris*; its waters once stood at a higher level.† It consists of a wide deep upper basin and a narrower and shallower lower one. In the former, at the base of the cone of *débris* deposited by the Rhone, the lake-floor is a broad, nearly level, plain, about 300 m. (984 feet) deep. The contours of its sides are evidently closely related to those of the slopes which rise from its margin. The fall is rapid, almost precipitous, beneath both Chillon and St. Gingolph. West of Vevey it is about 1 in 4, changing gradually to 1 in 10 opposite to Ouchy. The rise at the western end of the basin is gradual, and the depth at the barrier of Promenthoux is only 75 m. (246 feet). The other basin—the Petit Lac—between this place and Geneva, is a narrow, shallow trough, the bottom of which rises very slowly from a depth of about 70 m. (230 feet) to 50 m. (164 feet), thence gradually mounting to the efflux of the Rhone; but the continuity of the floor is slightly interrupted by five small shallow hollows,‡ roughly linear in arrangement. No alteration in the level of the lake-bed corresponds with the change from the comparatively hard limestone about the upper end of the larger basin to the comparatively soft sandstone of its lower end. The shallowing up to the barrier of Promenthoux and the Petit Lac itself do not seem related to the ancient glacier, for, so far as we know, its line of maximum thickness, which might be expected to indicate its greatest erosive force, pointed towards Neuchatel. If this glacier were competent to excavate the lake, surely it should either have worked steadily along the line of the Rhone to Geneva, and thus made a lake changing gradually in outline and depth, or have kept on more nearly along the axis of the upper lake.

* Le Léman 'Monographie Limnologique' (tome premier).

† Not less than 100 feet, and possibly higher.

‡ These sink from 15 to 20 feet below the general level.



An atlas of about twelve French lakes, including that of Geneva, has been recently published by M. Delebecque, of Thonon. In one of these a submerged river channel can be traced across a rather wide part of the lake. In most the depth diminishes wherever the shores approach. In the Lac de Bourget the slopes of the Mont du Chat are prolonged under water to a depth of about 300 feet—i.e. nearly to the lowest part of the bed. In short, almost every one of these lakes presents some anomaly hard to reconcile with a theory of glacial erosion.

One fact to which Professor J. Geikie has called attention,* seems at first sight strongly to support Sir A. Ramsay's hypothesis, and is the only real addition, in my opinion, which has been made to the original reasons. It is that many of the Scotch lochs are true rock basins, and that similar basins frequently occur outside their mouths. This also often holds of the fjords in Norway, New Zealand, and elsewhere. Professor Geikie points out that several of these basins occur just when the ice might be expected to obtain an increased scooping power. His map at first sight appears very convincing; but a study of the larger charts reveals many anomalies. Loch Linnhe, for example, from below the entry of Loch Leven, maintains a general depth of from 34 to 50 fathoms; then, below Loch Corrie, a channel may be traced which varies in depth from 50 to 60 fathoms, after which, in the Lynn of Morven, we find it deepen to 70 fathoms, then to 90 fathoms; and at last a little north-east of the line joining Barony Point with Lismore Point, it expands into a basin with a maximum depth of 110 fathoms. But outside, in the Sound of Mull (to the north-west) the depths become very irregular, varying from about 35 to 70 fathoms. Barony Point appears to be connected with Mull by a submerged isthmus, generally less than 20 fathoms below the surface. But here, if the glacier were stopped by impinging on Mull, it ought in splitting to be pushing hard upon its bed. In all this region the irregularities of the ice-bed are very perplexing, whatever hypothesis be adopted; but I will restrict myself to a single instance. Off the west coast of Scarba, under the lee of the "Islands of the Sea," and where the opening towards Colonsay makes it improbable that the ice can have forced into a narrower space, an elongated basin occurs in which the soundings—outside about 60 fathoms—deepen to 100, and at one place to 137 fathoms. The sea-bed about Arran presents similar difficulties. In short, here, at Loch Etive, Loch Lomond, and in other places, all goes well only so long as we restrict ourselves to generalities and abstain from details.

The Sogne Fjord in Norway is a remarkable basin. As its arms unite, its bed sinks to 511 fathoms at the mouth of the Aurlands Fjord; then descends gradually down to 567 fathoms, after which for a long way the soundings vary from 637 to 660 fathoms; but on reaching the outer

* 'The Great Ice Age,' p. 519.

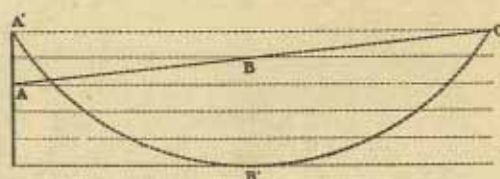
islands the sea-bed rises till it comes within the 100-fathom line. There is nothing, however, in the contour of the fjord to account for the marked increase of depth, while the opening at the islands seems insufficient to explain the shallowing; for the ice stream, according to the modern school of geologists, swept out far away to sea at the time of maximum glaciation.

The Vest Fjord also offers a number of difficulties, of which I must mention one only—namely, that a channel about 200 fathoms deep lies near the Norway coast to which the sea-bed descends very gradually from the Lofoten Islands. But the latter, as their outlines show, cannot have given birth to glaciers comparable with those of the mainland. Hence the scooping effect produced by the struggle between the opposing ice streams should have been manifested on the western, not on the eastern side of the fjord.

From these and other instances I infer that these singular basins, as a rule, have not been excavated by glaciers. Unequal subsidence frequently appears to occur. The movements near a coast-line often seem to be far from uniform. It must be remarked also that moraines are often left by retreating glaciers, and if these are on a scale at all similar to those of the old Alpine glaciers, very considerable inequalities would be produced. To such a cause the curious irregularities in the bed of the St. George's Channel seem—in part, at least—to be far more probably due. At any rate, I have never been able to connect them with any theory of glacial excavation. In short, the evidence of lochs, fjords, and the neighbouring sea-bed, does not appear to me sufficiently convincing to outweigh the arguments in the contrary direction.

The evidence which has been summarised above seems to lead to the conclusion that the excavatory power of glaciers has been much exaggerated. The European glaciers generally have not been very potent agents of erosion or even of abrasion, probably because the glacial epoch was comparatively of short duration. But I may be fairly expected to offer an hypothesis as a substitute for that which I discard. This was done full twenty years since, during which time advocates of the other have been almost unanimous in "letting it severely alone," but since then the evidence in its favour has been strengthened. Strange to say, this hypothesis was overlooked by Sir A. Ramsay when he claimed a victory for his own one, not so much for its positive merits as on the ground of its being the only one that held the field. Yet the hypothesis has always appeared to me one of the most simple and natural. It is this. The lakes above and below water present, as we have seen, the contours of ordinary valleys. Suppose them to have been eroded by the ordinary agencies, among which ice would sometimes play a subordinate part, and their beds to have been subsequently affected by differential movements. If the lateral pressures by which

a mountain chain has been formed have begun again to act after an epoch of comparative rest, during which the folded masses have been carved into peaks and valleys, it is more probable that alternating zones parallel with the axis of the chain would be affected by uplifting and down-sinking movements than that the massif would rise or sink uniformly as a whole. Probably, if such differential movements were comparatively slight, they would be more marked towards the outer part of the chain nearest to the region on which incoherent materials had more recently been deposited. Suppose then the outermost zone to rise and the next within it to sink, that part of the river valley would at once be converted into a lake. As a simple illustration take two points A and C in a valley 20 miles apart, and B half-way between them, and suppose the fall to be 10 feet a mile; B is 100 feet above A, C the same height above B. Suppose C to remain fixed, B to sink 400 feet, A to rise 200 feet, *i.e.*, to the level of C. A basin is now formed 20 miles long, which at its middle point under B is 500 feet deep. But it might be urged that evidence of such a flexure should be afforded by the rocks themselves. Suppose they had originally been horizontal—

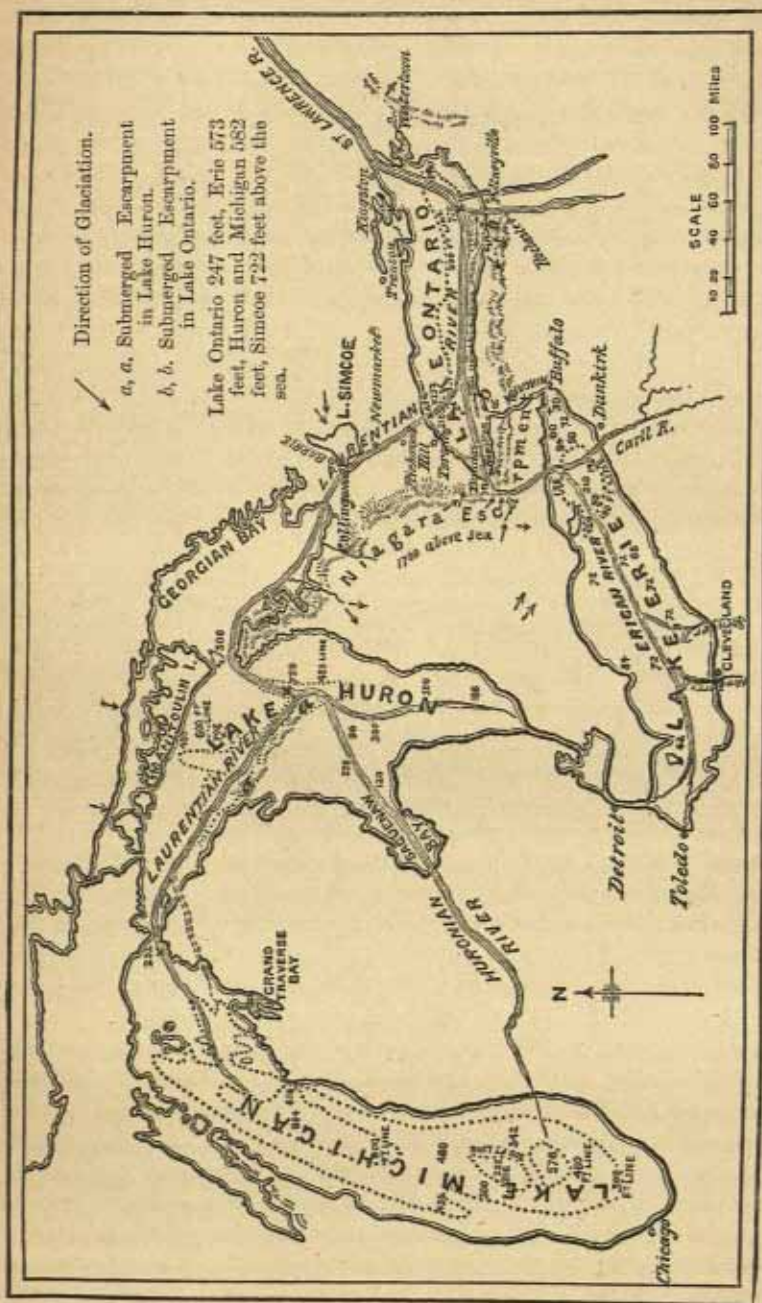


The intervals between the horizontal lines represent 100 feet.

they would now, between A and B, dip from the former to the latter at an angle measured by 500 feet in 10 miles, not quite 1 in 100, *i.e.*, less than one degree.

Such a case, however, is exceptionally favourable; as a rule the strata were considerably flexured, and folded long before the lake basin was formed, so that the detection of so trifling a disturbance is an impossibility. It is obvious that the effects of such a depression in a valley which was fairly regular in form would be to make the broadest and deepest part correspond. At the same time the contours of valleys are so variable, and depend so much on the nature of the rocks through which they are cut, that deviations from this rule are to be expected.

But we may be fairly challenged to cite any instance of lakes which have been produced by differential movements of the Earth's crust. Extreme glacialists formerly cast longing eyes at the great lake-basins of North America. They lie within the territory once occupied by an ice-sheet; they are true basins of considerable depth. Of late years their beds have been studied, and a convenient summary of the results



THE ANCIENT LAURENTIAN VALLEY NOW OBSTRUCTED AND FORMING THE GREAT LAKES. (From the *Q. J. Soc.*, 1890.)

is given by Professor J. W. Spencer.* I must content myself with the veriest outline. Lake Michigan is divided into two basins—the northern, 864 feet deep, the southern, 576 feet—by a broad plateau, about 450 feet below the surface. An old river channel, now choked by glacial drift, connects the latter basin with Saguenay Bay, in Lake Huron; the other one was united with that lake as at present, but also by a buried channel. Huron formerly did not drain, as it now does, into Lake Erie, but its slopes converge opposite to the opening between the southern end of Manitoulin Island and the mainland, and the valley thus formed can be traced through Georgian Bay to its southern end, whence another choked-up valley leads into Lake Ontario, west of Toronto. Erie, thus separated wholly from Huron, drained, also by a buried valley, into Ontario. In Huron and Ontario submerged escarpments have been detected. The contours, then, of this lake system, if it could be cleaned from the glacial *débris*, would resemble those of a system of river valleys. The lower part of the St. Lawrence has been proved to be a submerged river channel, and indicates a change of level amounting to some 1800 feet. At the present time Michigan is 582 feet above sea-level, and a portion of its bed more than 250 feet below it. The deepest part of Ontario is as much as 500 feet below this. But differential movements have continued since the lakes were formed, for the "Iroquois" raised-beach is full 600 feet higher at the north-eastern part than it is at the western end of the lake.

To conclude, glaciers, when the paths which they have traversed are carefully studied, appear to have acted, as a rule, as agents of abrasion rather than of erosion. Even in the former capacity they have generally failed to obliterate the more marked pre-existent features due to ordinary fluvial and subaerial sculpture. In the latter capacity they seem to have been impotent, except under very special circumstances; thus, while we may venture to ascribe to glaciers certain shallow tarns and rock basins in situations exceptionally favourable, we cannot assign to their agency either the greater Alpine lakes or any other important lakes in regions which were overflowed by the ice only during the period when it attained to an abnormal development.

The question which I have ventured to bring before you this evening has been discussed hitherto by the geologist rather than by the geographer. In reality it belongs to the wide neutral zone which lies between the two provinces of scientific investigation. In my treatment of it I may have seemed to some geologists to be almost abandoning their claims, by practically denying that glaciers are direct erosive

* *Quart. Jour. Geol. Soc.*, 1890, p. 523. Lake Superior, which certainly does not help the glacial erosion hypothesis, is not included. The depth of Michigan is 864 feet, of Huron 750 feet, of Erie 210 feet, of Ontario 738 feet. I am indebted to the kindness of Prof. Spencer and of the Council of the Geological Society for the use of the map illustrating the Paper just mentioned.

agents of the first magnitude. But however we may differ on this question, we should all agree—and this no less concerns the geographer—that glaciers have a most marked, even if it be a somewhat superficial, influence on scenery, and that by acting as storehouses of water and feeders of rivers they indirectly play a most important part in the work of earth-sculpture.

Before the reading of the paper the President said: To-night we make an excursion, I will not call it an incursion, into the territory of our neighbours the Geological Society. I think it is very desirable that we should make these excursions from time to time, if only for the purpose of showing that we claim to concern ourselves with everything that belongs to the theatre in which man lives and works. The eminent geologist whom we welcome to-night is known to all of you by name, and to some of you personally. I am sure that you will all listen with the greatest attention to what he has got to say, and I am not the less sure that when he has concluded his observations some members, to whose opinions also we attach great importance, will attack his views.

After the reading of the paper the following discussion ensued:—

Dr. BLANFORD: I am sorry the task of replying to Professor Bonney has not fallen into the hands of some one better qualified, for although I am prepared to defend the views of the late Sir Andrew Ramsay, of whom I was a pupil, I am at the same time not willing to go to the extent he did, and I do not attempt to suggest that the great lakes of America are due to glacial action. With regard to the moderate sized lakes of the Alps, such as Como or Geneva, the question is a very difficult one indeed, and if I were to attempt to go into it I should take as long to put the other side as Professor Bonney has done in laying before us his admirable summary of the arguments of the anti-glacialists. The chief points I should like to urge upon you are first, that I think Professor Bonney rather underrates the effect of erosion by ice. Not the ice but the stones imbedded in it scrape away the rocks upon which they impinge, just as the emery or diamond dust on the wheel of a lapidary grind down a gem. I cannot admit that the shape of a valley eroded by a glacier is the same as that caused by ordinary fresh water action. In Europe we are likely to forget that the big valleys among our mountains are glacial valleys, but if you go into countries where no glaciers ever acted and come upon the typical V-shaped valleys you see the difference immediately. In the Himalayas there are U-shaped valleys at higher and V-shaped at lower elevations, the higher ranges are the same in appearance as in the Alps, but the different form of the lower valleys strikes you at once. The evidence of erosion in glaciers does not depend upon what a glacier in its most effete stage can do, but the proof that glaciers do erode is to be found first of all in the very simple fact that the water issuing from beneath a glacier is always thick with mud. If ice has no effect in eroding what is the origin of the boulder clay? High up upon the sides of numerous peaks in countries affected by glaciers you find curious little tarns; there is one on the north side of Cadr Idris, one or two on Snowden; one of the most interesting I have seen is on the east slope of Snæhetta in Norway; in this case there is a little glacier coming down from the peak ending in a lake about $\frac{1}{2}$ mile long. An extremely good instance of a rock-basin formed by erosion is Easedale Tarn above Grasmere. Professor Bonney agrees that such tarns must have been excavated by ice action, but then comes the question where is the line to be drawn. As Professor Bonney has pointed out you may begin with tarns and go on by almost imperceptible

gradations to the highest lakes in the world. This was the argument maintained by Sir Andrew Ramsay, the only difference being that Professor Bonney begins by showing that the larger rock basins cannot be glacial, while Sir A. Ramsay commenced with the little tarns and showed the gradual passage from them to larger lakes. That the smaller tarns are due to glacial erosion is easy of demonstration, but the difficulties become great when we come to lakes like Como, because it is not easy to understand how glaciers can work down to that great depth and rise up again, and excavate a deep basin while moving over so long a space. On the other hand it is a curious and extraordinary fact, as Sir Andrew Ramsay pointed out, that in the area where ice has had effect lakes abound, but where no ice has affected the surface lakes are few in number. At the base of the Himalayas no lakes are found. The Himalayas are probably more recent than the Alps, as the beds of sandstone, conglomerate, etc., found disturbed at the foot of the Himalayas are more recent than those found in the Alps, so that if lakes are due to disturbance and tilting only, they ought to be at least as numerous in the lower Himalayas. Then we come to a most difficult question, that of fjords. You find them in Norway, on the west coast of Scotland and in America; one of the most typical being that of the Saguenay running into the St. Lawrence; it is excessively deep and terminates in a comparatively shallow sea. Why should fjords of this peculiar character be found so often in high latitudes where we know ice played a part, and why are they wanting in the tropics? In the tropics are found valleys depressed much below the sea-level. At the mouth of the Persian Gulf on the western side are numerous inlets formed by depression, well surveyed, because the telegraph cable was at one time carried across, but having by no means the characters of fjords. This then is the crux that remains to be solved, where we know that ice sheets and glaciers have existed we have lakes in large numbers, and the peculiar phenomena of fjords, but they are not to be found in places where so far as we know ice has not been. I do not mean to say positively that the larger rock-basins have been excavated by ice, but at the same time if no other theory save that of tilting is put forward, how does it come to pass that tilting has only taken place where ice has been. I must say that so far Sir Andrew Ramsay's theory holds its place.

MR. DOUGLAS FRESHFIELD, President of the Alpine Club: Some years ago when, as editor of the *Alpine Journal*, I had the privilege of being in correspondence with Mr. John Ruskin, he concluded one of his letters to me with the following characteristic sentence: "I hope that some day the members of the Alpine Club may desire to gather together their knowledge of glaciers and make a wholesome end of all glacier theories by due acknowledgment of James Forbes's conclusive ascertainment of glacier facts. They owe this duty to science, and should, it seems to me, take honourable pride in fulfilling it." I do not think the Alpine Club can be accused of having failed in doing its part in the work Mr. Ruskin proposed for it; in bringing, that is to say, recent geological theories into close contact with geographical facts. Mr. Whymper, as we all know, in his book on the Alps, entered largely into the question of glacier action, and since that time four Presidents of the Club—our late respected and beloved Fellow and Councillor, Mr. John Ball, Mr. William Mathews, Mr. Bonney (whom you have heard to-night), and last and least myself, have done our best to show that the geological theory of glacial excavation is inconsistent with the topographical facts as we and others have seen them, and that it is supported mainly by appearances which I may fairly call superficial. It would be preposterous in me to imagine that anyone here remembers, or that more than a few have read, a paper which I printed in December, 1888, in our Society's *Proceedings* upon "The Conservative Action of Glaciers." I cannot now recapitulate the facts I gave there; I can only refer to them. Among other things I pointed out how Sir Andrew

Ramsay himself had admitted the incapacity of glaciers in excavation. He writes for instance: "One great fact which the striations teach is this, that the broad and thick ice-sheet, urged on from the north, buried the whole of the region described; and, further, that the glacier moulding itself to the shape of the country (after the manner of all glaciers) was pressed right onward with so much force that the long northern slopes of the east and west valleys offered, comparatively, no more impediment to its onward march than an occasional transverse bar of rock hinders the onward flow of a river." It is physically certain, I believe, that ice must do most work in abrasion where its weight and velocity, its pressure and friction, are greatest. What we claim to show is that among the existing glaciers of the Alps you cannot find one which, where its weight and velocity are greatest, has done more than smooth and polish resisting protuberances and carry on loose material—not one which has done any serious excavation. Many of those present must have visited the end of the Mer de Glace, the Bossons Glacier, the Brenva Glacier, where they descend into the valleys. The ice has retreated of late, and let us see what it has done under its bed. These glaciers have left no lake-basins in their retreat; they have rather raised than excavated the ground. There is a steady upward slope from the village of Chamionix to the end of the Glacier des Bois. Turn to extinct glaciers. The old glacier of the Valley of Aosta could not widen the gorge of Bard; it left undisturbed on the plain near Ivrea gravels deposited before its visit. The old glacier of the Rhône had to mould itself to the narrow limits of the gorge of St. Maurice; where it was met by a great tributary from the Valley of the Arve, it dug no basin. The depths of the Lake of Geneva do not correspond to any sudden increase in the ice's volume or velocity. Look, again, across the Atlantic. The enormous Alaskan glaciers do not uproot tree-trunks; the Greenland glaciers break against the Nunataks; they do not remove them. Even the mighty ice-sheet that once spread across the North American continent had no power of destruction. I challenge our opponents to meet the facts set out in the Reports of the United States Surveyors I quoted five years ago. If then we find no modern glaciers digging lake-basins, how can we believe that the hollows on the earth's surface were made, or in any great part made, by glaciers? Dr. Blanford's argument from the frequency of tarns in mountain regions may be retorted upon himself. Some parts of the Alps are thickly set with tarns; true, but other parts, once equally glaciated, are not. The tarns occur in particular geological formations. In the chain of the Caucasus, 700 miles long, there are no lakes, there is hardly a tarn. What have the Caucasian glaciers been about, if it be glaciers that make lake-basins? Lake-basins, we admit, sometimes (not always, by any means) exist near and on glaciated ranges. Yes; and there will be found sufficient reasons for the fact. Where on the surface of our globe there are heights, there must be hollows; where there are central ridges, there will be furrows also, and parallel elevations. Then there must be basins; and until torrents, acting as saws, have tapped them, or, acting as mud-carts, have choked them, these basins will hold water. Another class of lakes will be formed by moraines acting as dams. There are many of these in New Zealand. The history of the hypothesis I am combating is not an uncommon one. There is a great deal of human nature in it. Geologists, like the simple children of the Syrian desert who attribute anything great to Alexander, have been apt to account for any strange phenomena by an heroic cause. At one time it was an universal deluge, or many partial deluges. Even De Saussure belonged to this school: he thought erratic blocks had been distributed by some mighty flood. Then there was the theory of volcanic, or igneous action: of catastrophes. Lastly, the true origin of erratic blocks was discovered, and the scratches and rubbing of the ice recognised. These superficial appearances were found over vast

areas. Ice became the new toy for science; and one of the ways in which science shows its eternal youth is in its passion for new toys! I will briefly point out, in conclusion, some of the effects glaciers have produced on contemporary landscape, and their geographical importance. Professor Heim of Zurich, whose important work is very insufficiently known in this country,* has laid down the law that "glaciation is equivalent to a relative cessation in valley formation." The cloak of ice protects the soil from the alternations of heat and cold; from floods and earth-slips and mud-avalanches. Water is at work under the ice, but under strict limitations. The torrent that has made its plunge in some *moulin* carves secretly and silently a deep, narrow cleft. Consequently, the traveller after passing the moraine-heaps which mark the most recent considerable extension of the glacier, finds the valley more U- in place of V-shaped, and at the same time shallower. Any rocky barrier across it shows convex surfaces smoothed and scratched by the glacier on the side opposed to its advance, and is slit through by the gash cut for itself by the once sub-glacial stream. Such are the features of the well-known Kirchet, near Meyringen. Of course it follows that some of the solid matter found in glacial streams is due to their own erosion, and not merely to the pounding together as they move along of the blocks to which the ice is serving as carrier. The bottom of a lately glacier-covered valley is flat because the ice has protected its bed from sub-aerial denudation; as well as from the inroads of earthslips and the fan deposits of side-streams. I saw once in the Caucasus an enormous mountain-fall carted clean away and carried ten miles by one of the glaciers of Ushba. The glacier was acting not as a spade but as a sledge. I could easily go on talking about the ways and varieties of the glaciers I have known; but I must not detain the meeting longer, lest the question before us should be changed from "Do Glaciers Excavate?" into "Do Glaciers Bore?"

Sir HENRY HOWORTH: I think it is a little hard upon my friend Professor Bonney that I should be called upon to speak on his side, as he is himself fond of fighting. This week I am publishing a big book, in which I propose to do my best to speak plainly about the views of the ultra glacialists, and to-night I must limit myself to one or two points. The first point is, that they have no right to appeal to ice until they prove the potency of ice to do the work. Now the mathematicians have shown that ice, under the pressure required to excavate a lake after travelling over a flat plain, would be crushed long before it reached the lake. It is thus shown that such excavation is a mathematical impossibility, as you have to import into ice an entirely new force before you can make it excavate. It is not a question to be treated on theoretic grounds, as it is often treated. You must ground your argument on some solid base before you are justified in proceeding at all. The arguments put forward by Sir Andrew Ramsay and Professor Tyndall on this subject, urging that all lakes and valleys are excavated by ice are mutually destructive, as one insists that the ice gradually loses its force, and the other declares that it must keep its force. Both these men wrote, long before it was proved that Forbes was right (to the very letter) in maintaining that ice, instead of being a rigid mass, or nearly so, travelling over slopes and great level plains, is, in fact, a viscous mass moving as water moves, and that when it ceases to get the impetus from the slopes behind, it ceases to move and work at all. Experiments published in the 'Philosophical Transactions of the Royal Society' proved that Forbes's grand generalisation was perfectly true, and proved also, it seems to me, that ice is an impossible agent to appeal to as an excavator. We are told to-night that these lakes only occur in regions which have been occupied formerly by

* Heim, 'Handbuch der Gletscherkunde.' See Review by Mr. F. F. Tuckett in *Alpine Journal*, vol. xii.

glaciers. The fjords have also been appealed to. Dana, as far back as 1849, was the first to appeal to ice as the excavator of fjords. Now these fjords exist in many places where, so far as we know, no ice or glacier ever existed at all. Falsan has shown that all along the southern shores of France, in Dalmatia, and on the shores of Asia Minor, fjords exist. Now the Austrian geologists who tramped in search of evidence of ice action all over European Turkey, could not find a trace of an old glacier. There is the remarkable fact also pointed out by Mr. Freshfield, that in Greenland, where the study has been carried on notably by one remarkable Englishman who lived there twenty years, and whose papers have been overlooked, and also by Peterssen, who both show that on the spot nothing like excavation by these enormous glaciers with their rapid motion can be found. My friend Dr. Blanford says if you do not appeal to glaciers, what about the boulder clay? I say boulder clay has not been formed by glaciers at all. I have been where glaciers are working hard, and, like a good many other people, have absolutely failed to find boulder clay being formed. Boulder clay necessitates an appeal to something more than glacial action, and certainly we find nothing in the moraines of glaciers in the least resembling boulder clay. There seem to me to be other facts and arguments which preclude absolutely this appeal to ice. Ice is exactly like the sand paper used by the sculptor after his assistant has chipped out the statue. What comes out of the bottom of a glacier, as was said by Mr. Freshfield, in the shape of the so-called glacier milk is largely the result of the rubbing down of the masses that have fallen down the crevasses from the backs of the glacier. A glacier can no more take blocks of stone out of its own bed than a man with his hands tied behind him can pull teeth out of his own head: and the products of erosion we see everywhere are caused by the rubbing of the stones that fall down the crevasses and chafe against the rocky bed. Thus we find that glaciers do not excavate, but only polish. Being a disciple of Professor Bonney, who has done so much to illustrate this question, I could not resist your invitation to say a few words.

Mr. W. M. CONWAY: Reference has been made to the Karakoram Mountains, and the Himalayas have been described as later than the great range of mountains behind them. I have recently visited a portion of that range, and seen the largest glaciers in that district, notably the Hispar, which is the largest of all. It has, in quite recent times, retreated 25 miles, and is now only 40 miles long. In the first place it has not left a U-shaped valley, but a remarkably V-shaped valley, and there is no trace of the valley having been gouged out; and in the second place, nowhere in the neighbourhood does there remain any lake whatever. This afternoon I saw two men looking in a print-shop window, arguing as to how an engraver had produced a certain effect with the burin; as a matter of fact the thing was a mezzotint. Their discussion reminded me of the arguments regarding lake basins. I think, if the geologists arguing about this matter made themselves familiar with glaciers by contact with many, it would ultimately occur to them that they had never seen one engaged in excavating. I, and many others, have been under glaciers, both in their upper, middle, and lower courses, and have never seen one excavating. They slope and alide in the smoothest possible manner, and here and there do a little scratching. It was looking at the print, and not being familiar with the process, that brought this theory into prominence.

Professor BONNEY: My friend, Sir Henry Howorth, Mr. Freshfield, and Mr. Conway have left me very little to say, but I will just touch upon one or two points very briefly. With regard to the St. Lawrence, I may point out that the basin of the Saguenay is formed by a submerged moranic boundary between the valley of the Saguenay and the main valley of the St. Lawrence. With regard to the absence of lakes from the Himalayas, and presence in the Alps, if basins were made by glaciers

the two results would be simultaneous ; so the question of relative age will not come in. With regard to tarns in rock basins, these only occur under most favourable circumstances, where ice may have been expected to have had great erosive power. Now, the argument of my earlier papers was, that if glaciers do excavate, they should make tarns at intervals down the valley. Dr. Blanford forgot that mud from glaciers does not prove erosion, but only abrasion, a distinction which I have drawn ; and I quite agree with Mr. Freshfield, a large quantity of mud comes from tributary streams, not from the glacier. Several of the Alpine lakes, in fact, the most important, occur at the ends of the courses of glaciers, where, according to most people, they would be quite impotent to excavate, in fact, where they approach their death-beds. It would seem that glaciers are like some people, who idle away the best part of their life, and try to have a desperate expenditure of good deeds before they leave it. Another point, on which I do not agree with my friend, is that of Alpine valleys. These, as a rule, are not U-shaped, but V-shaped, only being U-shaped in a few very exceptional cases. I have followed up, I should think, half the valleys in the Alps. The upper Haslithal Valley is throughout V-shaped, yet it is ice-worn almost down to the level of the torrent. My argument amounts to this, that if we accept the hypothesis put forward by Professor Ramsay, we are landed in a crowd of practical difficulties.

The PRESIDENT : You will, I think, agree with me in the opinion that Professor Bonney's views have been well smitten and well defended, and will direct me in your name to return your very best thanks alike to him and everyone else who has taken part in the discussion.

PYTHEAS, THE DISCOVERER OF BRITAIN.

By CLEMENTS R. MARKHAM, C.B., F.R.S.

THE discovery of the British Isles in the third century before Christ, by a Greek scientific explorer, was the last link in a chain of events which commenced with the establishment of the Ionian colonies in Asia Minor. We may trace these events as they succeed each other, with ever growing interest, for we shall find that their motive was always a noble thirst for geographical discovery and exploration. The original impulse came from those Ionian colonies in Asia Minor, whose people were gifted with all the Grecian genius for scientific research, for imaginative speculation, and for maritime enterprise. They are said to have established themselves on this coast in about 1060 B.C., to have formed themselves into twelve autonomous cities, to have advanced in civilisation, and to have extended their influence in various directions, during a long period of peace and prosperity, extending over several centuries. Their coast reached for about 80 miles from Phocæa on the north, to Miletus on the south, bordering on Caria ; and the Ionian territory included the islands of Chios and Samos. Deeply indented by bays, it is formed into numerous harbours, and the dozen cities were clustered round their shores. First on the north, between the Cumæan and Hermæan Gulfs, was Phocæa, a colony from Ionian Phocis. Then came

the rocky promontory, on which rose the shaggy forest of Mount Mimas, with the island of Chios by its side, and on the shores of the promontory and island were clustered the cities of Clazomene, Erythræ, Teos, and Chios. From Mount Mimas, a great bay sweeps round to Mount Mycale and the island of Samos, and on or near its shores were the cities of Lebedos and Colophon, and the holy city of Ephesus. Point Trogilium, at the end of Mount Mycale, separates this bay of Ephesus from the southern bay where stood the cities of Priene, Myus, and Miletus, with Samos on its fertile island, off Mycale.

The twelve Ionian cities formed a sort of union, and their delegates periodically met at Panionion, on the slopes of Mount Mycale, to celebrate their games, which were managed by the neighbouring city of Priene. This was a loose bond, and did not prevent all intestine feuds, but it served to maintain a feeling of common origin and of common interest among the citizens of the twelve Ionian colonies. Another such bond was found in the worship of their goddess Artemis at Ephesus. This was an Asiatic divinity whose worship the Ionians found established among the original inhabitants when they arrived. It was a personification of the fructifying powers of nature, to whom the Greeks applied the name of their own goddess Artemis, combining with her worship that of her brother Apollo, the sun-god.

From a very early period these Ionians of Asia Minor were distinguished for the energy and ability with which they conducted their commercial ventures, and not less for their intellectual progress. Of the seven wise men of Greece, two, Thales and Bias, belonged to cities of the Ionian colonists. Thales predicted the solar eclipse which put an end to the battle between the Medes and Lydians, fixed the year at three hundred and sixty-five days, determined the course of the sun, and was the first to form a theory of the universe. He was a native of Miletus, as were his disciples Anaximander and Anaximenes, who were the first to measure time by a sundial. Heracleitus was a citizen of Ephesus, Xenophanes of Colophon, and Anaxagoras, who had an observatory on Mount Mimas, was of Clazomene. In later times, Samos produced more than one astronomer.

Led and helped by such brilliant intellects, the Ionian sailors soon covered the Ægean with their ships, and began to venture on more distant voyages. Thales taught them to steer by the Little Bear like the Phœnicians, instead of the Great Bear,* while Anaximander gave them some idea of geography, and constructed maps and a celestial sphere. Their ships were enlarged and built on improved principles, and commerce enriched their cities. The invention of money is attributed to the Lydian kings, but the Ionian seaports were among the first to adopt its use. The electrum staters of Phocæa, and her smaller coins,

* Both were wrong. The star nearest the Pole in those days was a *Draconis*!

impressed, on one side only, with a seal or a seal's head, were circulated throughout the known world. The coin of Erythræ was stamped with a rose, that of Clazomene with a winged boar, Teos with a seated griffin, Chios with a seated sphinx, and Colophon with a lyre. Coins of the sacred city of Ephesus were stamped with a bee, the emblem of Artemis. The coin of Samos showed a lion's face, of Myus a bird, and of Miletus a lion or lion's head. Lebedos and Priene had no early coins, being small cities with little trade.

At different times Miletus, Samos, and Phocæa took the lead. Miletus, with her four harbours, enjoyed great prosperity, and established many colonies, chiefly on the Hellespont and in the Euxine. Abydos, Lampsacus, Cyzicus, Sinope, and Amisus owned her as their mother city. Samos, with her famous temple to Hera, was also a great maritime power under Policrates, and it was a Samian ship that first reached the eastern extremity of the Mediterranean,* B.C. 639. But it was Phocæa that held the supremacy of the sea for the longest time—from about B.C. 602 to 560.

Phocæa stood on a peninsula between the Cumæan and Hermæan gulfs, at a distance of about 20 miles north of Smyrna. The city possessed two excellent harbours, called Naustathmus and Lampter, and in front of them was the island of Baccheion, adorned with temples and other public buildings. Herodotus says that the Phocæans were the first Greeks who undertook distant voyages. Their sailors were acquainted with the Adriatic, the Tyrrhenian, and the Iberian Seas; and they were the first to visit Tartessus, a kingdom in the south of Spain, where the King Arganthonius was warmly attached to them, B.C. 639. This proves that the Phocæans undertook their expeditions without any predatory motives, and with the great objects of discovery and the extension of trade. Hence their relations with the people they visited were friendly and peaceful. They established a settlement at Alalia on the east coast of Corsica, in B.C. 566; but their great work was the foundation of the rich and powerful colony of Massalia (Marseilles) in B.C. 600.

When the Phocæans arrived on the south coast of Gaul, the country was ruled by a chief named Nannus. It was in about the year 600 B.C. when Euxenus, the Phocæan, opened friendly intercourse with him. The Grecian stranger was present at a banquet given by the Gaulish chief, when it was arranged that his daughter Petta was to give a cup of wine to the suitor she preferred. She presented it to Euxenus. They were married, and the lady received the Grecian name of Aristoxena, bringing the site of Massalia as her dowry. Their son was named Protis, and the family of Protiadeæ flourished at least down to the time of Aristotle. Brought to the Grecian colonists by one fair

* 'Herodotus,' Melpom., iv. 5.



Gaulish lady, Massalia was saved by another. Comanus, the son of Nannus, formed the design of seizing the place during a festival. His men entered the town in disguise, while he and a chosen band waited for a signal outside, the gates being all wide open. But a kinswoman of Comanus had a Grecian lover. She betrayed the plot to him, and Comanus was attacked and killed. Ever afterwards the gates of Massalia were closed when a festival was celebrated within the walls.

Warned by an oracle, the Phocæans had received a statue of the earth goddess from Ephesus, and with it they brought the first branch of olive to Massalia. Twin temples were raised to the Ephesian Artemis and the Delphian Apollo on the acropolis of the new city. The colonists formed settlements along the Gaulish and Iberian coasts, and while extending their commerce in all directions, they taught the Gauls in their neighbourhood to live under laws, to plant the olive, and to prune the vine. Cordial relations continued to exist between Phocæa, the mother city, and Massalia.

In the middle of the sixth century, a great calamity befell the Ionian cities. The Persian Empire, under Cyrus, was extended to the shores of the Ægean, and most of the autonomous colonies had to submit, sooner or later, to the barbarian yoke. But freedom was the breath of life to the sailor princes of Phocæa. In B.C. 546 their city was closely besieged by Harpagus the Mede. Preparations were made for a desperate defence; and Arganthionius, King of Tartessus, the tried friend of Phocæa, gave large sums for strengthening the walls. At length, when longer resistance became hopeless, the Phocæans applied for a truce of twenty-four hours before surrendering, which was granted. They had collected a large fleet in the harbour. A noble resolution had been taken. The Phocæans actually carried out such a patriotic scheme as the Dutch meditated long afterwards, when their liberties were threatened by Louis XIV. Harpagus only demanded the demolition of one bulwark, and the dedication of one house in token of submission. But the Phocæans preferred exile to a home without freedom. They embarked with their wives and children, and their movable property. The descendants of such men were worthy to be the discoverers of the British Isles.

Teos alone followed the example of Phocæa. The other Ionian cities submitted after a brave struggle, and gradually sank into dependencies of Persia.

The fugitives, after resting at Chios, sailed away to their settlement at Alalia in Corsica. But they could only maintain their position there by exhausting sea fights with Etruscans and Carthaginians. Eventually a portion settled at Velia in Italy, while the bulk of the Phocæans were welcomed in their own colony at Massalia. Thus the distant city on the coast of Gaul became a second Phocæa, a second emporium of commerce, a second centre of maritime enterprise and discovery.

Massalia, the new Phocæa, was situated most advantageously for the prosecution of commercial enterprises by an intelligent and energetic people. It had an excellent harbour, a strong citadel, and the coasts of Spain and Italy stretched away on either hand, while its proximity to the mouths of the Rhone placed the internal trade of Gaul in the hands of the Massalians. It was not long before they had established trading-stations or settlements along the shores of the Mediterranean both to the east and to the west. To the east were Tauroentum, Olbia, Athenopolis, Antipolis the modern Antibes, and Nicæa, while far down in the south of Italy was the Phocæan colony of Velia. To the west were Rhodanusia at the mouth of the Rhone; Agatha near the modern Narbonne; and Rhoda, originally a colony of Rhodes, at the foot of the Pyrenees, the modern Rosas. Near Rhoda was the port of Emporium. On the modern Cape St. Martin in Spain, the Massalians had a temple of Artemis and a look-out station called Hemeroscopium, their town of Artemisia, the modern Denia, being at its base. The most western Phocæan trading-station, which was already a ruin in Strabo's time, was Menaca, the modern Malaga.

Massalia soon became a rich and flourishing city, devoted to the worship of Artemis and Apollo, whose temples crowned the acropolis. The Phocæan emigrants traded peacefully to all parts of the Mediterranean, and continued their friendly relations with the people of Tartessus, even beyond the Pillars of Hercules. Their earliest coins were uninscribed divisions of the Phocæan drachma, and on their small obols of B.C. 350 they engraved a crab, symbol of Artemis, as protectress of harbours. One would have wished that the seal, the old coin of Phocæa, had been retained. It would have been specially appropriate for the Phocæan colony, one of whose sons was destined to bring to the knowledge of the world the first tidings of the Arctic Regions. But the seal disappeared. In its place was substituted a coin with the head of Artemis, and hair adorned with sprigs of olive on one side, and a lion with the letters ΜΑΣΣΑ (ΛΙΑ) on the other. This coin became the chief currency in Gaul as far as Lyons and in the valley of the Po, and was copied by more distant Celtic tribes.

For the commercial relations of the Massalians extended their ramifications to far distant regions some of them unknown to the civilised world. Through their enterprise the countries of civilisation were supplied with rare products, the origin and sources of which, in some cases, were unknown. Especially was this the case with tin, the *Κασσίτερος* of the Greeks. Unmentioned in the 'Odyssey,' the name occurs as a white and shining metal in the 'Iliad,' used as ornaments for arms and chariots. Herodotus had heard of the regions whence tin was brought, as the *Cassiterides*, but he knew nothing about them. The Massalians knew this much more than Herodotus, that tin and amber were brought from a distant country far to the

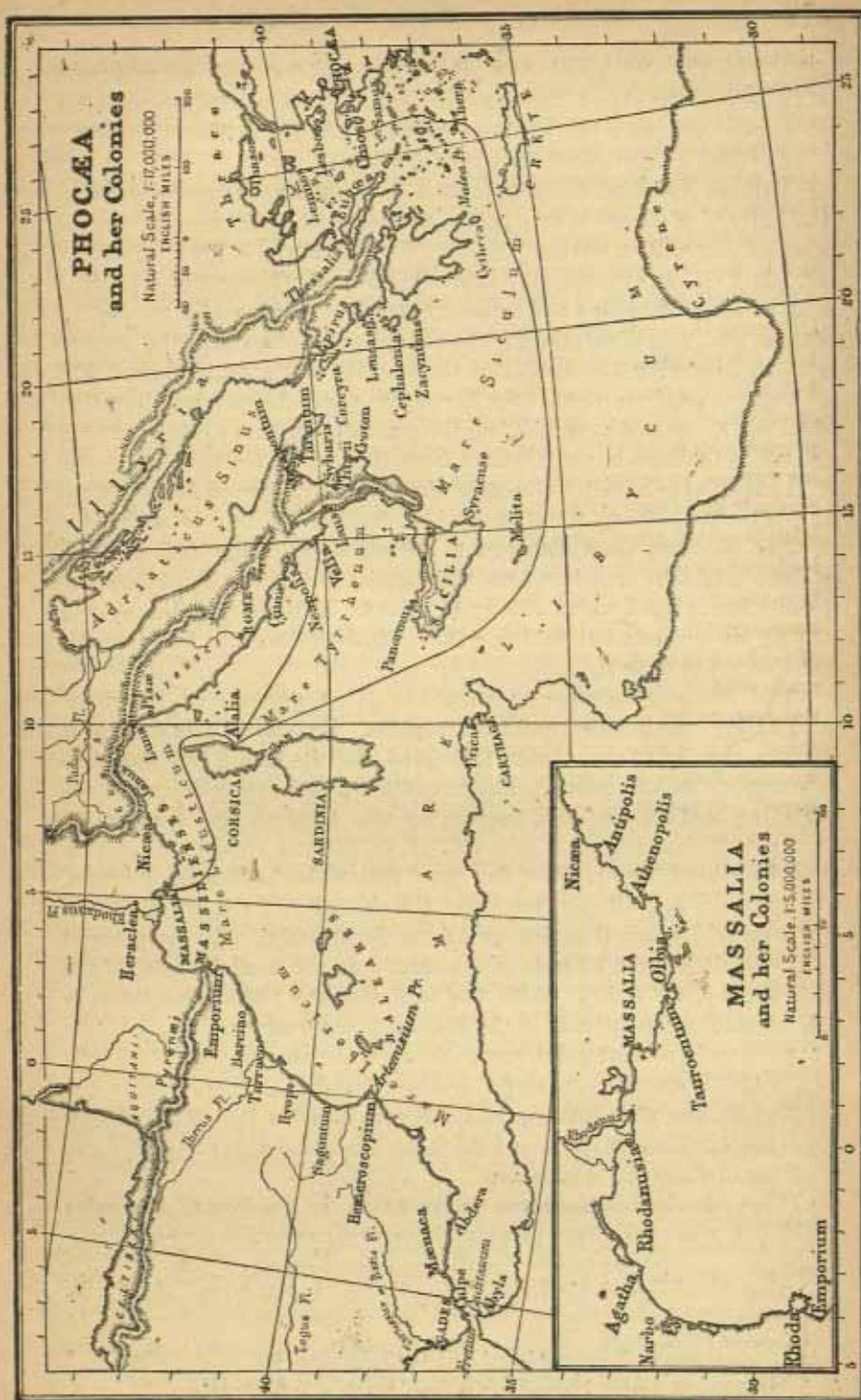
north, to their station at the mouth of the Rhone, by Gaulish merchants. Naturally the enterprising Phocæans desired to know more. They were explorers and the descendants of explorers. It would be an easy transition from the wish for knowledge, to the resolution to attain it. We thus come to a consideration of their expeditions beyond the Pillars of Hercules, and to the achievements of their great explorer Pytheas.

The Carthaginians, in about 500 B.C., had sent two expeditions beyond the Pillars of Hercules, one under Hanno to go south along the coast of Africa, the other under Himilco northwards in search of the tin country. Of course the despatch of Himilco implies that voyages had previously been made through which the country of tin mines had become known, but such voyages were made by the sailors of Tartessus in the south of Spain. Himilco described Abyla and Calpe, and then a lofty promontory called Æstrymnis, opening on the Æstrymnis Gulf. Here his voyage appears to have ended, Æstrymnis being Cape Finisterre in Spain,* and the gulf answering to the Bay of Biscay. He heard of islands called the Æstrymnides scattered widely about, rich in tin and lead, and inhabited by active traders navigating in vessels of skins. Thence it is two days' sail to the Sacred Island near the Island of Albion. The names given by Himilco occur nowhere else. He was told that the people of Gades (Tartessus) traded with the Æstrymnides,† but the voyage was made with difficulty in four months, the wind often failed, monsters of the deep swam to and fro, and sea-weed hampered the progress of the ships. This hearsay information was of little or no value. But, whether useful or worthless, it is certain that the Carthaginians kept it secret, and that the Greeks of Massalia had never heard of the voyage of Himilco.

Any discovery beyond the Pillars of Hercules by the Phocæans of Massalia must have been achieved by their own unaided efforts, without guidance from the experience of Himilco or any other foreign navigator. Fortunately, the colony possessed a man eminently fitted to conduct an exploring expedition, in the person of Pytheas, the mathematician and astronomer. It is alleged by Polybius that Pytheas was in poor circumstances, and we may, therefore, conclude that the enterprise was a government expedition of which Pytheas was placed in command. The nearest approximation we can get to its date is the time of

* Mr. Elton holds that Æstrymnis is Cape St. Vincent, and that the Æstrymnides represent Madeira and Teneriffe: pp. 15, 22.

† According to Posidonius tin was found among the Artabri, the modern Galicia in Spain. This may be the source whence came the tin of Gades and the Phœnicians; while all the British tin was brought through France to the mouth of the Rhone. The 'Æstrymnides' would then be a fable of Himilco (see 'Bunbury,' ii. p. 89); and 'Cassiterides' seems to have been a vague general term for the source of the tin trade, originated by Herodotus.



Alexander the Great and Aristotle,^{*} about B.C. 330, and we may well suppose that the object was the discovery of the countries whence came those rare and valuable products which reached the Massalians by a long overland route and a descent of the Rhone.

Pytheas prepared for his perilous undertaking by carefully fixing the latitude of Massalia as a point of departure. His pre-eminence in his own day will be obvious when we recollect that he lived before the principal Greek astronomers, Eratosthenes and Hipparchus, and that none of his predecessors had demonstrated the methods which he adopted. The earliest way of calculating the distance of a place from the equator was by observing the length of the longest and shortest days. The ancient geographers divided the Earth into parallel zones, within which the longest day had a certain length, generally an hour: one zone from twelve to thirteen hours, the next from thirteen to fourteen, and so on. The zones were called "climates," from the Greek word *klima*, a slope or inclination. They were unequal in width, the zone in which the longest day was from fourteen to fifteen hours being 600 miles in width; while the zone in which the longest day was from nineteen to twenty hours has a width of only 125 miles. Pytheas used this system during his voyage; but in fixing the latitude of Massalia he adopted a more accurate method.

The Phocæan astronomer erected a large gnomon at Massalia,† divided into one hundred and twenty parts. He observed its shadow at noon on the day of the solstice, and found that its length was forty-two of the parts on the gnomon, less one-fifth—that is, forty-one and four-fifths to one hundred and twenty, or two hundred and nine to six hundred. This proportion gave $70^{\circ}. 47'. 50''$ for the altitude of the sun. The length of the longest day was fifteen hours fifteen minutes. Eratosthenes and Hipparchus found the obliquity of the ecliptic to be $23^{\circ}. 51'. 15''$,‡ which they deducted from the altitude. The complement of the result was the latitude of the place less the semi-diameter of the sun, namely, $43^{\circ}. 3' 25''$. With the semi-diameter added, the result is almost exactly the latitude of the Marseilles observatory.

Another important point was to fix upon the nearest star to the pole as a guide for steering the ship. Pytheas found that there was no star on the pole, but that there were three very close to it.§ These would have been β Ursæ Minoris and α Draconis in those days; and Pytheas used one of these as his pole star.

It is probable that there was no other man, in the days of Alexander the Great, who could have prepared for a voyage of discovery by fixing

* The work of Pytheas was known to Dicæarchus, who was a pupil of Aristotle. The date of the voyages must, therefore, have been not later than the time of Aristotle.

† 'Cleomedes ap Lelewel,' p. 49.

‡ 'Eratosthenes ap Ptolemy Almag.' i. 2; 'ap Lelewel,' p. 49.

§ 'Hipparchus in Arati phænomen,' l. 5, from 'Lelewel,' p. 48 (n. 121).

the exact latitude of his point of departure, and by selecting correctly the star by which he should shape his course. For the rest, his countrymen were well able to furnish him with a serviceable vessel. From the temples of Artemis and Apollo in the citadel it was a short descent over rocky ground to the harbour, which, like the city, was protected on the land side by a strong wall. Here were the *νεόσοικοι*, or docks, and the armoury, or arsenal, called *ὀπλοθήκη*. A large Massalian ship was a good sea-boat, and well able to make a voyage into the northern ocean. She would be from 150 to 170 feet long—the beam of a merchant ship being a quarter, and of a war-ship one-eighth the length—a depth of hold of 25 or 26 feet, and a draught of 10 to 12. Her tonnage would be 400 to 500, so that the ship of Pytheas was larger and more seaworthy than the crazy little *Santa Maria* with which, eighteen hundred years afterwards, Columbus discovered the New World.

A Grecian ship was strongly built on regular principles, commencing from the *τρόπις*, or keel, a horizontal beam which in the older ships rose from the centre in a curve. Under it was the *κέλευσμα*, or false keel, and above the *δρύονον*, or keelson. The stem (*στείρα*) and stern-post were inserted on the keel nearly at right angles, and from the keel also rose the ribs (*ἐγκοιλία*), connected and strengthened by cross-beams (*στρωτήρ*). The upper deck, or *κατάστρωμα*, had bulwarks made of trellis-work. In large ships there was a lower deck, or *ἔδαφος*, above the hold (*κοῖλον*), with a second set of cross-beams (*ζυγόν*). The prow (*πῤῥῆρα*) and poop (*πρύμνα*) were raised above the upper deck, and had half-decks, called *ικρίωμα*. The bow and stern were both pointed and identical in construction, the stem and stern-posts both ending in a volute, or the neck of a swan. But the bows were fitted with a beak or ram, level with the water-line, consisting of rafters let into the body of the vessel, and ending in a point shod with iron, in three blunt teeth. Two beams, supported by props, protruded from both sides of the beam. The hawse-holes on each side of the stern were bound with iron, and were called *ὀφθαλμοί*, or eyes.

The Grecian ships were further strengthened externally by a wooden ledge along the water-line, and also by four stout hawsers, called *ὑποζώματα*, passed round the hull below the water-line. Boards were placed over the ribs inboard. On the poop there was a tent-like house for the pilot and helmsman called the *σκηπή*, and there were two oar-like rudders or *πηδάλια*, on each side of the stern-post, which were worked by a tiller-rope, called *χαλινός*, running across the vessel, the rudders always being kept parallel. The mainmast, or *ἰστός μέγας*, was stepped in the centre of the ship, and fitted with yards to which square sails were laced—a mainsail, maintopsail, topgallant sail, and even a triangular royal. The mast had stays (*πρότονοι*), backstays (*ἐπίτονοι*), and shrouds (*καλοί*). There were two smaller fore and after masts with

lateen sails, used for paying her off or for putting her up into the wind. The upper deck was covered with an awning, in fine weather, called *κατάβλημα*, where a flagstaff was also raised (*στηλὴς*) with a flag (*σημεῖον*).

The rowing-power of ancient galleys, supplementary to the sails, has been looked upon as the equivalent to the steam-power of modern times. In the Grecian ship there was a narrow gangway on both sides, called *πάροδος*, lower than the upper deck, and just above the rowlocks for the upper tier of oars. The rowing apparatus, or *ἐγκωπον*, was in the centre part of the ship, and the space for the *ἐρέται* or rowers was called *ζύγωσις*, the bench itself being *ζυγά*. The distance between the rowers was 4 feet, and in a large trireme there were fifty-four *θαλαμίται* or bottom rowers, fifty-eight *ζυγίται* or middle, and sixty-two *θρανίται* or upper rowers, making one hundred and seventy-four all told. The oars for the *θαλαμίται* were $7\frac{1}{2}$ feet long, and the length had to be increased by 3 feet in each ascending row. The oar (*κάπη*) passed through a circular *τρήμα* or rowlock, which was covered by a tarpaulin when not in use. The sailors or rowers were of course much more numerous than the *ἐπιβάται* or marines. The *κελευστής* or officer in command of the rowers had a lieutenant (*ἐπόπτης*), and not the least important person on board was the *τριηραῖλος* or piper, by whose music the rowers kept time.

The anchor (*ἄγκυρα*), as shown on the most ancient coins, had two flukes, and a shank with a ring at the end for the cable. In some anchors there was also a ring at the meeting of the flukes, to raise or turn them if they had not caught the ground. The cable (*σχοινία ἄγκυρεῖα*) was worked by a *στροφεῖον* or capstan; and for going on shore there were boat-hooks (*κοιταὶ*) and gang-boards (*κλιμακίδες*).*

In the days of Alexander, a voyage of discovery beyond the Pillars of Hercules was as bold and daring a conception, as was a voyage in search of the Indies by the western route, in the days of Ferdinand and Isabella. We have seen that Pytheas, the first of the great explorers, like the illustrious Genoese of later times, prepared himself for his difficult task by long and patient study of the astronomical bearings of the question. Thus well-provided with all the knowledge of his time, he raised his anchor,† and commenced his coasting voyage towards the Sacred Promontory,‡ the western limit of the known world. The Grecian ships were supposed to make an average of about 500 *stadia* or 50 miles in a day's sail, the *stadium* being the unit of measurement for all geographical distances.§ Coasting along near the shore, the ship of

* This account of the structure and fittings of a Grecian ship is taken from the work of E. Guhl and W. Koner, translated by Hueffer, 'Life of Greeks and Romans,' Chatto & Windus; 1877.

† In the end of December, according to Lelewel, p. 35.

‡ Cape St. Vincent.

§ Colonel W. Martin Leake contributed a valuable paper on the stadium as a linear measure to Vol. IX. of the Society's *Journal*. The original stadium was the length



Pytheas would first have come to the Massalian settlement at the mouth of the Rhone, and then to Rhoda and Emporium (the modern Ampurias) in the beautiful bay of Rosas, at the base of the Pyrenees. Next the temple of Artemis, crowning the lofty promontory now dedicated to St. Martin came in sight, where the Massalians had their *Hemeroskopion* or look-out station. There was a settlement called Artemisia (the modern Denia) at the foot of the heights, where the explorers could anchor and find rest. The last friendly haven would be at Manaca, the modern Malaga. Sailing through the Straits of Calpe, the Greek mariners would scarcely venture to stop at Carthaginian Gadeira, although, in times gone by, the native ruler of the country had been on such cordial terms with Phocæa. But the cruel Semites since established at Gadeira were enemies of western civilisation, and Pytheas sailed slowly on to the Sacred Promontory, the end of the known world, very slowly, for the 48 leagues from Cadiz to Cape St. Vincent took him five sailing days.

Pytheas continued his coasting voyage to the north as far as Œstrymnis (Cape Finisterre), the probable furthest point of Himileo, then eastward along the north coast of Iberia, and round the Bay of Biscay. His narrative is lost, but we gather that he described the coasts of Iberia, made valuable observations respecting the tides, and furnished information touching the best way of passing from Iberia to Celtica or Gaul. "He had acquired a practical acquaintance of the navigation along the north coast of Spain." His first recorded observation on the voyage had for its result that the longest day was fifteen hours, which would be in lat. $40^{\circ} 59'$ off Oporto.

Pytheas found that the north-western part of Gaul formed a long promontory called Calbion, the country of a tribe called the Ostimii, which stretched far to the westward. He even thought that it extended for 2000 *stadia* to the west of Cape Finisterre of Spain. But great allowances must be made for errors in longitude at a time when no means were known of estimating it, beyond guess-work. He mentions an island off the coast called Uxisama, evidently intended for Ushant. A second observation is given of sixteen hours for the length of the longest day, equal to 49° N., which is within 30 miles of the latitude of Ushant. The explorer left the north coast of Gaul, and shaped a direct course for a part of Britain which he called Cantion (Kent), the Cantium of Cæsar. This must have been the route, because he reported that the coast of Gaul, where he left it, was some days' sail from Cantion.

The Cantion of Pytheas was doubtless the modern Kent, although it

of the Olympic foot-race, equal to 600 Greek feet. The Greek foot, deduced from the stylobate of the Parthenon, is equal to 12.1375 English inches. This gives $8\frac{1}{10}$ stadia to a statute mile, 10 stadia to a geographical mile, and 600 stadia to a degree. A stadium was also $\frac{1}{2}$ of a Roman mile, equal to 625 Roman feet; and a Roman foot was 11.65 English inches, which gives the same result.

may be intended to include additional territory to the north. Here he stopped; and we are told that he not only landed, but travelled over a part of Britain on foot. He probably went westward to collect information respecting the tin trade, which in those days would have entailed a very difficult and perilous journey.*

Britain, in the third century before Christ, was almost in a state of nature. The valleys were covered with primeval forests, their lower parts were occupied by vast swamps, and it was only on the downs and hill ranges that there were *Gwents*, or open clearings. Still the Keltic tribes had been in possession for several centuries, and had made some advances in civilisation. They brought domestic animals with them, raised wheat and other cereals, and had iron tools and arms, wooden chariots with iron fittings, and ornaments of bronze and gold. Pytheas saw and made note of the farming operations and way of living among the natives of Cantion (Kent). Between this south-eastern district and the Gwent now comprising the downs of Wiltshire and South Hampshire there was the great forest of Anderida, extending from Hampshire to the Medway. Pytheas would have to pass this forest on his way to the western part of Britain (the present Cornwall), which was called *Belerion*.† Here he found the country of the tin, which was dug out of the ground in mines with shafts and galleries. The people were very hospitable, their commerce with foreign merchants having civilised them and softened their manners. The metal was carried by them in six days' journey to an island called Ictis (St. Michael's Mount), whence the traders from Gaul conveyed it across the Channel, and down the Rhone to Massalia. "This island is described as surrounded by the sea at high water, but connected with the mainland by a tract of sand left bare at low water, so as to render it a peninsula to which the tin was carried in waggons."‡ Pytheas no doubt gave a stimulus to this trade, and was probably the first to introduce coined money into Britain. After the discovery of the gold mines of Crenides, in 356 B.C., Philip of Macedon produced £250,000 worth of gold coin a year. The beautiful stater of Philip was everywhere diffused. It soon reached Massalia, whence it was circulated inland, and it was seized on by the Gauls as an object of imitation in about A.C. 300. Pytheas may well have

* If the account given by Diodorus of *Belerion*, *Ictis*, and the tin trade is, as is more than probable, taken from Timæus, it was derived from the work of Pytheas. In that case the journey on foot through Britain must have been to *Belerion*, and the coast opposite *Ictis*.

† Ptolemy has *Bolerium* for the Land's End. Posidonius seems to have been the first to use the name *Belerion* for the tin country.

‡ *Mictis* of Pliny, and *Vectis* of Ptolemy. Mr. Elton thinks it was Thanet (p. 34). Sir E. Bunbury considers that there is no reasonable doubt that it was St. Michael's Mount to which the description precisely answers. (ii. p. 197) Ptolemy gave the name of *Vectis* to the Isle of Wight.

brought the first staters of Philip to Britain, thus introducing the use of money. They were afterwards roughly imitated by the natives; but no British coin has an earlier date than A.C. 200.

Several pieces of information respecting the natives of Britain, related by Pytheas, have been preserved. In consequence of the rain and absence of sun, the former did not use threshing-floors, but threshed their corn in large barns. They stored the ears of corn in pits underground, and the part that had been longest in store was brought out daily and prepared for food. They made a fermented liquor from barley, which they used instead of wine; it was called *curmi*. As Columbus was the discoverer of tobacco, so his great predecessor, Pytheas, discovered beer. Pytheas also says that the Britons made another drink from honey. Their houses were of wood and thatch, and he mentions the war-chariots, but adds that the chiefs were generally at peace with each other. He believed the people to have been *autochthones*, or aborigines.

When Pytheas returned to his ship, in some haven of Cantion, he proceeded northwards along the coast of Britain; and his next observation gave seventeen hours as the length of the longest day. This would be in lat. $54^{\circ} 2' N.$, somewhere in the neighbourhood of Flamborough Head. Still coasting to the north, in his great voyage of discovery, he reached a point at the northern end of Britain where the length of the longest day was eighteen hours. The corresponding latitude is $57^{\circ} 58' 41'' N.$, which is that of Tarbett Ness, in Ross-shire. As he advanced to the Pole he found that the cultivated grains and fruits, and almost all domesticated animals, gradually disappeared. The people in the far north were reduced to live on millet, herbs, and roots. The intrepid explorer still pushed onwards to discover the northernmost point of the British Isles. Coasting along the shores of Caithness and the Orkney Islands, he finally arrived at a land where the length of the longest day was nineteen hours. This was in lat. $60^{\circ} 51' 54'' N.$, in Burra Fjord, on Unst Island, the northernmost of the Shetlands. Pytheas gives the name of *Oreas* to this extreme point of the British Isles—a name which in later times was transferred to the Orcades, or Orkney Islands. It was doubtless a native name.

It was at *Oreas* that Pytheas received information of an Arctic land called *Thule*, at a distance of six days' sail, and near the frozen ocean. Here the summer tropic and the Arctic circle are all one, that is there is no night at the summer solstice and the latitude would be $66^{\circ} N.$ * *Thule* may either have been Iceland, or the coast of Norway in the neighbourhood of Alstenoe and Vitsen-fjord. Pytheas does not say that

* He heard also that, during one season the night was continuous, and during another it was continuous day, 'Cosmas Indicopleustes,' ii. 149, and 'Gemini,' v. 22; ap 'Lelewel,' p. 37.

Thule was an island, nor that he visited it.* It is more likely to have been Norway, because Iceland was unvisited and unknown until long afterwards. The word Thule, in the forms Thyle, Thul, Tell, is ancient Saxon, meaning limit. Telle-mark is in Norway. Pytheas also received reports of the physical aspects of the region beyond Thule. His account has been turned into nonsense by 'Strabo,'† copying from the explorer's bitterly hostile critic Polybius. Yet even as we have it, the account is a good description of a dense fog at the edge of the pack, amongst sludge ice, which "can neither be travelled over nor sailed through." He might have seen such ice occasionally, at no great distance from the Shetlands.

Pytheas was thus not only the discoverer of Britain, but the first explorer who received information respecting the Arctic Regions. He was, as Professor Rhys has truly said, "one of the most intrepid explorers the world has seen." If, as we may infer from their approximate accuracy, the five observations for the length of the longest days were taken by the explorer himself,‡ the voyage must have occupied about six years. Sailing southwards from Orcas, Pytheas returned to Cantion, and continued the long voyage onward to Massalia, whence he soon set out on another expedition to examine the coasts of the continent from Gades to a river called the northern Tanais.§

Coasting round the Bay of Biscay, and along the coast of Gaul, as in the previous voyage, Pytheas continued to hug the continental shore instead of crossing to Britain. He passed the mouths of the Rhine, where the Ostioni dwelt, and entering the Gulf of Mentonomon, reached a river which he called the Tanais. The gulf appears to have been the bay formed by the coasts of Schleswig-Holstein on one side and Friesland on the other, and this northern Tanais is identified with the Elbe.|| The shores were inhabited by a tribe called Guttones. He

* Mr. Elton thinks that Pytheas sailed north of the Loffoden Islands to the North Cape (p. 67); but Sir E. Bunbury, in spite of a doubtful passage in Cleomedes, is inclined to the view that the explorer did not himself visit Thule.

† 'Strabo,' i. 157. "Neither earth, water, nor air exist separately, but a sort of concretion of all these' (resembling marine sponge), 'in which the earth, sea, and all things were suspended' (thus forming as it were a link to unite the whole together). 'It can neither be travelled over nor sailed through.' (As for the substance, he affirms that he has beheld it with his own eyes; the rest he reports on the authority of others.)" The sentences in parentheses are probably interpolations of the critic.

‡ I cannot think, with Lelewel, that Pytheas merely obtained the length of the longest days from statements of natives.

§ Sir Edward Bunbury, M. Lelewel, and Mr. Elton, think that Pytheas did not return to Massalia before undertaking his second voyage, but that he sailed to the continent from Cantion, so that there was practically only one voyage. But the writer of the article 'Pytheas' in Smith's 'Dictionary of Greek and Roman Biography,' is of opinion that "the words are scarcely susceptible of such an interpretation," and holds that there were two distinct voyages.

|| Timæus says that the Argonauts went up the southern Tanais (Don), transported their boats overland, and went down the northern Tanais (Elbe).

was here told that, at a distance of a day's sail, there was an island called Abalon or Abaleia,* where the amber (*electrum*), which is an excretion of the condensed waves, is carried by the sea on to the shore, in the spring. It is used for fuel by the islanders, and was also sold by them to their neighbours the Teutones, through whose trading ventures it eventually reached Massalia, and became an article of commerce in the marts of the civilised world. Abalon was probably the western coast of Schleswig, whence a supply of amber used to be obtained, and perhaps this was also a trade route for the more distant sources of amber supply in the Baltic.

Pytheas lived to return to Massalia once more, and to write one, if not two books, describing the events and results of his memorable voyages. The work entitled 'On the Ocean'† is believed to have referred to the expedition to the British Isles; while the 'Periplus'‡ described the second voyage to the mouth of the Elbe. Both are unfortunately lost to us.

We know, from his observation at Massalia, that Pytheas could fix a latitude within a few minutes, when the declination and sun's semi-diameter are applied to the result. It is, therefore, logical to credit him with knowing where he was when he observed and recorded the length of the longest day on five different occasions. An opposite plan has been adopted by some critics. They first settle where he was, and then decide that his latitude was 100 miles out. For instance they first settle that the Orcas of Pytheas was Duncansby Head in $58^{\circ} 39'$, and then condemn him for putting Orcas in $60^{\circ} 50'$. A more logical course would be to assume that Orcas was in $60^{\circ} 50'$, and that consequently it could not be Duncansby Head, but that it must be a place in the latitude indicated by Pytheas. The distances in *stadia* and *day's sail* with which Pytheas is credited by Strabo must either be deductions by Eratosthenes and others from the data of Pytheas, or else corrupt readings. Most of them are preposterous, and in neither case can Pytheas be fairly made responsible for them.

We may now estimate his place among explorers. The Ionians of Phocæa and Massalia had been trained as daring mariners and thoughtful students for generations, alike in the mother city and in the colony; and all their admirable qualities seem to culminate in the life-work of Pytheas. His learning and his discoveries form the fitting crown of their history. The seal on the coins of Phocæa, and the lion on the coins of Massalia appear as emblems of the Arctic Regions and of the British Isles. In the fulness of time the cities which owned those emblems produced a son, who, through his great knowledge and intrepid

* Called "Baillia" by Diodorus, following Timæus.

† Περὶ τοῦ Ὠκεανοῦ. 'Geminus, Elem. Astron. in Petav Uranol,' p. 22.

‡ Περὶ πλούς. 'Marcianus in Geog. Min.,' i. 63, and 'Scholiast on Apoll. Rhod.,' iv. 761. References in Smith's Dictionary, art. 'Pytheas,' and in Lelewel, p. 25.

daring, became the discoverer of Britain, and the first bearer of tidings respecting the Arctic Regions. Pytheas was a geographer and an explorer in the highest sense. For he must have devoted long years to qualify himself for his great task, and his work had placed him in the first rank of nautical astronomers before he undertook his voyages into the unknown ocean. His learning, and the perilous character of his enterprise, make him comparable with Columbus, while Englishmen may well deem that his discovery was, beyond all comparison, the most important that any explorer has ever made.

In connection with the lamentable destruction of so many precious works of antiquity, one of the strangest things is the way in which fragments and scraps, which, from the loss of so much else, become of infinite value, have been drifted down the stream of time on to our distant shore. About the voyage of Himilco we should know nothing but for the chance of a poet of the fifth century having embodied notices of it in his verses, and for the still greater chance that some of these verses happened to escape destruction.* The chances by which our slight knowledge of the work of Pytheas have reached us are still more remarkable. The accounts of his astronomical observations, and of his voyages of discovery, necessarily attracted much attention from his contemporaries; and although Dicaearchus is said to have rejected some of his conclusions, they received fair treatment from the great astronomers Eratosthenes and Hipparchus; and his works were largely used by the historian Timæus, who was his contemporary. On the other hand Polybius condemned Pytheas as unworthy of belief, apparently because the discoveries of the man of action conflicted with the preconceived ideas of the theoretical geographer. Polybius flourished two hundred years after the time of Pytheas. He criticised Eratosthenes and Hipparchus severely for accepting the statements of the great Massalian astronomer and explorer.

Even though the books of Pytheas are lost, if we could have seen the comments of his critics, both favourable and hostile, we should have been able to gather a great deal more than we now know respecting his life-work. But the works of Eratosthenes, Hipparchus, and Timæus are also lost, and the attack of Polybius on Pytheas was contained in his missing books. Strabo, the geographer, like Polybius, was fond of criticising the work of his predecessors. He lived three hundred years after the time of Pytheas, but he adopted all the prejudices of Polybius, and his method caused him to make copious extracts, not only from Polybius, but also from Eratosthenes and Hipparchus respecting the work of their Massalian predecessor, with a view to its disparagement.

* 'Ora Maritima,' describing the coast from Massalia to Gades, by Avienus Rufus Festus, who is believed to have flourished in the end of the fourth century A.D. It contains some extracts from a work on the voyage of Himilco, which is not quoted nor mentioned by any other writer. The voyage itself is just mentioned by Pliny.

It is from these extracts in Strabo that our knowledge of Pytheas and his voyages is mainly derived.

We have to choose between Eratosthenes and Hipparchus on one side, and Polybius and Strabo on the other. The illustrious astronomers were men with a scientific training, earnest searchers after truth, and capable of weighing evidence. Strabo, like Polybius before him, was intolerant of any statement which ran counter to his preconceived ideas. He would not have believed the god Hermes himself if he told him that he had been to the ends of the earth, much less "that charlatan Pytheas." His other argument is that "the veracity of a writer who has been false in describing countries with which we are well acquainted should not be too much trusted in regard to unknown places." This is true enough. Strabo, however, gives no instance of Pytheas's want of veracity respecting well-known places. But the criticisms of Pytheas by Strabo are satisfactorily disposed of by the fact that whenever Strabo specifies a falsehood or a blunder of Pytheas, the explorer is approximately right, and the theoretical geographer is wrong. If Strabo had treated the statements of Pytheas with the respect they deserved, instead of calling him a liar, his own ideas would have been more correct. He would not have placed Ireland to the north of Britain. He would not have expunged the peninsula of Brittany from his map. He would not have placed the north coast of France in the latitude of Bordeaux. As between Pytheas and Strabo, there can be no question now as to which of the two was the more correct geographer. Still we must be grateful to Strabo for having preserved nearly all we know of Pytheas, without looking too closely into his motives. Strabo fully acknowledges the merits of Pytheas as an astronomer and mathematician, and commends the accuracy of some few of his statements. Although the history by Timæus is lost, Diodorus Siculus, and Pliny, in his natural history, have handed down to us a few precious extracts from it, relating to the work of Pytheas.

It is in this curious way, chiefly indeed through the desire of Strabo to discredit his narrative, that the few particulars respecting the voyages of Pytheas have been passed down to us. They are all contained in the works of Strabo, Diodorus Siculus, and Pliny.*

The voyages of Pytheas have received much attention from the scholars of Germany† and France,‡ but I believe only two have

* In reading the works of these three authors, I have used 'Geography of Strabo,' translated by Hamilton (Bohn ed.); 'Bibliothèque Historique de Diodore de Sicile. Traduit par Miot' (Paris, 1834); 'Histoire Naturelle de Plin. Traduction par Ajasson de Grandseque' (Paris, 1833).

† Fuhr, 'De Pytheæ Massiliensi dissertatio' (Darmstadt, 1835). Brückner, 'Historia Reipublicæ Massiliensium.' F. A. Ukert, 'Geographie der Griechen und Römer' (Weimar, 1816-43, 5 vols.). Redslob, 'Thule: die Phöniciischen Handelswegen nach den Norden' (Leipzig, 1835). Bessel, 'Pytheas von Massilien' (Göttingen, 1858).

‡ D'Anville, 'Mémoire sur la navigation de Pythéas à Thulé' (Mém. de l'Académie

adopted the views of Strabo; Gosselin* in France and Sir George Cornwall Lewis† in England. The grounds of the unbelief of Gosselin are that Pytheas omitted to mention certain things which his critic considers that he must have mentioned if he ever made the voyage.‡ As the books of Pytheas are lost it is as impossible for Gosselin to affirm that he did not mention these things as it is for the advocates of Pytheas to say that he did. But these imaginary omissions in a lost book supply no valid argument against the authenticity of the voyages. Pytheas probably did mention all the points enumerated by Gosselin.

The reason given by Sir George C. Lewis for concurring in the hostile judgment of Strabo was that he believed he had found the false statement of Pytheas in describing countries with which Strabo was well acquainted, to which that geographer referred without specifying it. Sir George C. Lewis found the offending assertion in one of the 'Scholia of Apollonius Rhodius.'§ There Pytheas is alleged to have said that if any person placed a piece of iron at the mouth of Stromboli with some money, he found in its place, next morning, a sword or any other article of iron he wanted. Stromboli, like Ætna, was supposed to be the workshop of Vulcan. He also said that the surrounding sea was once in a boiling state. It is not alleged that Pytheas asserted these things of his own knowledge. He very properly repeated the interesting myths that he had heard in his travels, and this practice, while adding to the value of his work, does not in the slightest degree justify a doubt of his own accuracy and good faith.

The general, indeed the almost universal opinion of scholars who have recently investigated the question is that Pytheas is worthy of credit, and that his voyages are authentic.|| Sir Edward Bunbury may be accepted as the highest and most reliable living authority on this

des Inscrit. et Belles Lettres, tom. xxxvi., 436). Gassendi, 'Opera' (iv., 530). Bougainville, 'Eclaircissements sur la vie et les voyages de Pythéas' (Mém. de l'Académie, tom. xix.).

* P. F. J. Gosselin, 'Recherches sur la géographie systématique et positive des Anciens' (1798-1813, 4 vols.). J. Lelewel, 'Pythéas de Marseille et la géographie de son temps' (Bruxelles, 1836). Aout, 'Etude sur Pythéas' (Pamphlet, Paris, 1866).

† Sir G. C. Lewis, 'Historical Survey of the Astronomy of the Ancients' (8vo, 1862.)

‡ "How explain his silence about the Cassiterides? Why, when he speaks of Thule, does he say nothing of the Oreides? How did he make a mistake of 2½° in latitude in the extreme north of Scotland, when he had observed the latitude of Marseilles so well? Why did he not mention the tin trade with the Timii? Why does he not describe the bay between Cape Sacré and Calbion? Why does he say the tide ceases at Cape Sacré?"

§ The reference of Sir G. C. Lewis is to 'Schol. Apollon. Rhod.,' iv. 761; 'Schol. Callim. Hymn Dian.,' 47.

|| Smith's 'Biographical Greek and Roman Dictionary,' art. Pytheas; Sir E. H. Bunbury, 'History of Ancient Geography' (1879); Charles T. Elton, 'Origins of English History' (1882; second edit., 1890); Professor Rhys, 'Celtic Britain' (1884).

subject. The late Professor Freeman used to say that he always felt perfect confidence in any article under which he saw the initials E.H.B. Sir Edward's decision is that Pytheas really made the voyage, and that he brought back much useful information. We may, therefore, accept as an established historical fact, that Pytheas of Massalia obtained the first information respecting the Arctic Regions, and that he was the discoverer of the British Isles.

A JOURNEY FROM THE SHIRE RIVER TO LAKE MWERU AND THE UPPER LUAPULA.*

By ALFRED SHARPE.

On July 21st, 1892, I left Zomba and reached Mpimbi on the Upper Shire the same day, and was there joined by Mr. John Kydd, who accompanied me on my journey. From Mpimbi we went up the Shire River by boat to Fort Johnston, where we found the ss. *Domira*, and shipped our goods on her for Karonga.

On August 1st we left Fort Johnston in the *Domira* for the north, taking twenty-nine Zanzibari police as an escort; also one donkey. While at the Fort I took observations for latitude, the result of which was $14^{\circ} 25' 46''$ S. On August 4th we reached Bandawe, and there recruited carriers for the journey. I succeeded in getting one hundred and ten men, and with these we went on in the *Domira* to Karonga, where we arrived on the 11th. At Bandawe I took observations for latitude which placed the Mission Station in $11^{\circ} 53' 36''$ S. The calculations for all the observations taken by me throughout my journey are enclosed herewith. On Lake Nyasa I worked for latitudes with the meridian altitude of the sun. After leaving Karonga I used the stars Vega, α Pavonis, and α Gruis.

At Karonga I had the opportunity of purchasing a steel section-boat, one which Captain Stairs had brought with him on his expedition and sold to the African Lakes Company at Karonga. It subsequently proved invaluable to me. On August 21st I reached the African Lakes Company's "Fife" Station, half way across to Lake Tanganyika. This station, which includes a population of four or five hundred natives, is surrounded by a stockade, a bank, and a deep ditch, and is impregnable to any attack by natives or Arabs. This place is on the north-eastern borders of the Awemba country, and Mr. McCulloch (who is in charge of the station) has succeeded in opening up friendly relations with several of the important Awemba chiefs, who had hitherto kept out of all dealings with us (the English), and endeavoured to close their country to us. The Awemba have always been urged by the Arabs to

* Map, p. 576.

keep their country closed to the whites. This is because it is one of the great sources of supply of slaves. All the people caught by the Awemba in their constant raids are sold to the Arabs. On my journey two years ago to Mshidi's and Katanga, I passed across the Tanganyika road, and at that time the West African "jigger" (*Sarcoptylus penetrans*) had just made its appearance on the south end of Lake Tanganyika. On my present journey I found that it not only was quite plentiful now at Tanganyika, but had crossed the plateau and reached Nyasa. At Karonga and at all the villages on the road to Tanganyika jiggers (locally called "Matakenya") have become a pest. Doubtless before long they will reach Blantyre and the east coast. On August 25th I called at the French Mission Station at Mambwe, and was very hospitably and kindly treated by Father Van Oost, the missionary in charge. On August 29th I called at the Fwambo Station of the London Missionary Society, in charge of Mr. Jones. This place is also protected by a stockade, a bank, and a ditch, and is very strong. It has a population of some three to four hundred people, who have settled with the missionaries for protection.

On August 30th I arrived at Abercorn Station on the southern shore of Lake Tanganyika. Mr. Kydd had on this day the misfortune to fall into a game-pit, and his thigh was pierced by a wooden stake. This laid him up and brought on fever, and he had to be carried in a hammock for the next two weeks. Abercorn Station I found much improved since I was there two years ago. A stockade has been built round the settlement, and the stream which enters Lake Tanganyika in Rhodes Bay had been diverted and a new channel dug for it. This has drained the flat below the station, which instead of being swampy as it formerly was, is now excellent planting land. A few hundred natives from surrounding districts have settled with the whites at Abercorn, and are building villages in Rhodes Bay. Abercorn has more trade than any of the other stations in British Central Africa, not only trade in ivory with the Arabs, but also in cloth and other trade goods, provisions, hardware, etc., with the various Europeans now on Tanganyika. The station has no boat or steamer; the possession of one would enable them to multiply their present trade many times over. Throughout the Tanganyika and Mweru districts the rainfall of 1892 (January, February, and March) was unusually heavy. The little lakelet of Kilo near the village of Zombe, which for some years past has been quite dry, is now full of water. In Ulungu and Itawa the rice crops were much damaged by the floods, and, as a result, food was very scarce. Mr. Swann, the London Missionary Society's agent on Tanganyika, having kindly offered to transport my caravan to Sumbu at the southwest corner of Tanganyika, I left Abercorn in the mission steamer *Good News* on September 7th, and reached Sumbu the same night. The steamer had to return to Abercorn to bring over the remainder of my

caravan. Bwana Teleka, the chief of the Arab town of Sumbu, was away on a journey with ivory to the coast. Mwine Kambi, his headman in charge of the town, was civil and obliging. From here I sent letters on to Abdallah bin Suleiman, telling him of my arrival in Itawa, and that I should shortly visit his town. The latitude of Sumbu I found to be $8^{\circ} 29' 20''$.

The first day's journey on leaving Tanganyika going west is rather bad—stony hills and thickets. I only took a short march of 8 miles to the Kikuka waterholes. Three miles after leaving Sumbu I crossed the dry, rocky bed of the Mungela River which runs into Tanganyika some 3 miles north of Sumbu. (In Captain Hore's chart of the south-west end of Tanganyika there is a stream marked as Mongera, placed as running into the lake some way south of Sumbu. The name is the same (in native ears) as Mungela, and it is evidently the same stream; but Captain Hore has probably put it in by report, and has been mistaken.) My camp at the Kikuka waterholes was in south latitude $8^{\circ} 31' 2''$. On September 12th I travelled 15 miles to Mkula's town, which I found to be in lat. $8^{\circ} 30' 38''$ S., having during the day crossed the watershed between Tanganyika and Mwe. From Mkula's to Mweru the country is mostly level, and there would be little difficulty in making a good road. Mkula's town is situated on the Chisela River. This has been at some previous period a large river, but now it is a succession of reedy, grass-covered pools, and the stream does not run except during the rains. Leaving Mkula's on September 11th, I crossed the Chisela and followed its right bank to its entrance into the Mweru Swamp (old lake). I then followed the northern shore of the swamp to its north-westernmost corner, and cutting off a piece of it reached and crossed the Choma River. This great Mweru Swamp is the old lake, the southernmost corner of which I crossed in 1890. Its average width is from 14 to 16 miles, and its length about 35 miles. It lies north-east and south-west, and is now a vast sea of green reeds and swamp-grass, with occasional patches of open water. Many elephants find a safe refuge in it, and only come out while the heavy rains are on. My first camp west of Mkula's on the shore of the swamp was in lat. $8^{\circ} 29' 18''$, my next in $8^{\circ} 28' 48''$. On September 16th I crossed the Choma River, a deep muddy stream 10 yards wide and 2 feet deep (in the dry season), which runs into the Mweru Swamp at the north-west end. The Choma is the only permanent stream of running water crossed between Tanganyika and the north end of Lake Mweru (Moero). On leaving the Choma I found myself in the Mweru Salt Country. Salt is taken from here to Tanganyika, Lunda, Mambwe, Iemba, and even to the countries on Lake Nyasa. The country traversed between Mkula and Kaputa was without inhabitants—a poorly-watered country but full of game, mostly buffalo, zebra, roan antelope, pookoo (*Cobus varoudi*), lechwe, etc. The

two last named antelopes go in large herds, and are often found together. They are very much alike in appearance, and are, together with the impala, known by the natives by the name of "Nswala." At Kaputa there are hot springs; but I doubt whether these have any connection with the salt deposits. The inhabitants of Kaputa get their water from the Choma River, 2 miles away. They grow little or no food crops, but buy from others with salt. From Kaputa I went south-west to Mkupa, another salt-making village, the track leading us over large plains, the soil of which is impregnated with salt.

Salt is obtained thus: The salt soil is dug out and carried into the villages; here everyone is a salt-maker. Large funnels made of twisted grass rope are placed on stands, the funnel is filled with salt soil, water is poured in, and the mass stirred up well; the water then filters through and drops from the bottom of the funnel into earthenware pots placed below. This salt water is then boiled and the water evaporated. A certain amount of dirt remains with the salt, but the African has no objection to that. The crystal is rather large. From Mkupa I went south-west and west, and camped on the Kasalawa rivulet, no running water but occasional pools. This camp was in lat. $8^{\circ} 34' 53''$ S. From here I went in two days direct to Rhodesia, the administration station on Lake Mweru. The district between Mkupa and Mweru is undulating and covered with scanty forest. Water is rather scarce, but can generally be got in pools and holes here and there throughout the country. The soil is good and the rains plentiful during their season; but there are now no inhabitants owing to the former raiding work by the Arabs under Tippoo Tib's people, and latterly by Abdallah bin Suleiman. At Rhodesia I found Mr. Crawshaw, who had been in charge of that post for nearly a year. Rhodesia Station is situated at the extreme north-east corner of Lake Mweru on a cliff some 80 feet above the lake shore. The climate of Mweru seems to be healthy: Mr. Crawshaw enjoyed good health during the time he was there. Rhodesia is on the direct road to the west, and is the nearest point of Mweru to Tanganyika. Round Rhodesia and Mputa there are salt deposits similar to those of Kaputa. The inhabitants of Mputa (a village close to Rhodesia) used to work the salt; they have, however, recently been driven out by Abdallah bin Suleiman. The latitude of Rhodesia is $8^{\circ} 39' 28''$.

Having put together the steel boat, and left the caravan at Rhodesia, I left on September 22nd for Abdallah bin Suleiman's. I travelled south-east to where the Movu river-bed issues from the great Mweru Swamp. I found this river as I had found it in 1890, a marshy bed, but with no running water in it. Mr. Crawshaw, however, informed me that during the past rainy season it was full of water, and that he had crossed it waist-deep. Vast herds of game covered the plains at the south end of the Mweru Swamp. I crossed the Mkubwe River

on the 23rd, and reached the ruins of Nsama's large town in S. lat. $8^{\circ} 59' 35''$. The Mkubwe River, which runs into the Mweru Swamp from the south, is a similar river to the Choma, but larger, muddy, deep, and full of crocodiles. Nsama, the Chief of Itawa, who had his town fourteen miles west-south-west of Abdallah's town, gave me much assistance two years ago on my journey to Katanga, and supplied me with a few carriers. In 1891, however, he was attacked by Abdallah bin Suleiman. The siege of his town lasted for three months, and eventually, with the assistance of some of the Awemba tribes, Abdallah drove him out. Nsama was killed and his people scattered, many were captured and sold as slaves. Nsama had two sons, Chipimbiri, who had a small town near the Mweru Swamp, and Mkula, who still holds a strong mud-walled town. Mkula is looked upon as the successor of Nsama.

I reached Abdallah's on September 25th. His headmen met me some distance from his town and escorted me in. He treated me hospitably. I left Abdallah's on September 27th, and reached Rhodesia again on October 2nd. On the way I caught a young elephant, but it was too young to rear; it died after two days. I endeavoured to rear it on tinned milk, but it did not take to it; it had got knocked about too much in the catching.

I decided that Mr. Kydd should march by land with the caravan to Kazembe's, and that I would explore in the boat the northern, western, and southern shores of Lake Mweru, and meet him at Kazembe's town. I was anxious to ascertain the course of the Luapula River from its entrance into Mweru up to the highest point of navigation. I left there in a boat with six natives on October 4th. One day took me the length of the northern coast of the lake to the north-western corner, latitude $8^{\circ} 31' 28''$. Mpueto's is a mile-and-a-half north from the lake shore.

On October 5th I passed the exit of the Luapula River (which I visited in 1890)* and sailed down the west coast of Mweru to Chipungu's town. Thence, in three more days, to the southernmost corner of the lake. The northern half of Mweru's west shore is bounded by cliffs rising abruptly from the lake shore to 150 to 200 feet. Below these cliffs there is absolutely no level ground, nothing but a mass of broken rocks which have fallen from above. It is only here and there where small streams from the hills behind have broken gorges through the cliffs, and carried out deltas of rich loamy soil, that a landing can be safely effected or habitations met with. On each of these little deltas is a small village or collection of huta. The people were at first very timid, but when recognised (having travelled by land up this coast of Mweru two years ago) I was everywhere well received and supplied with quantities of food. In S. lat. $9^{\circ} 5' 10''$ the cliffs cease, and thence,

* See *Proceedings*, R.G.S. January, 1892.

going south, the lake is bordered by flat land and marshes. The southernmost portion of the lake (in lat. $9^{\circ} 30'$) is the south-west corner which ends in a large, shallow, weed-covered bay. All the southern end is very shallow, the depth 3 miles out from the shore being only from 8 to 12 feet. This end of Mweru is gradually filling, the Luapula is silting it up. Lions are very plentiful along the southern shore. I shot two and saw several more. One night my camp was fairly besieged by lions. Passing along the old southern shore, past the entrance of the Luapula River, I entered the inlet at the south-east corner, which on my visit to Kazembe's in 1890, I was told was Mofwe. I thought that by following this up in the boat I should reach near to Kazembe's, and I had on my previous visit been told that Mofwe communicated above with the Luapula River.

On my first journey to Mweru and Kazembe in 1890, I had no sextant with me; on my present trip I found that all my estimated latitudes on the previous journey were much too far north. I now found that Mofwe did not communicate with the Luapula River. The inlet at the south-east corner of Mweru—which is called Chimbofuma—is merely a deep bay into the vast swamps which lie at the south end of the lake. It is separated at its south-east end from the Mofwe lagoon by 2 or 3 miles of dense swamp, impassable either by boat or on foot. After coasting round the Chimbofuma inlet, therefore, and ascertaining that there was no exit from it to the south, I sailed back into Mweru, and returned along the south shore to the entrance of the Luapula River. It enters Mweru by several branches, or rather it has formed many reedy islands at its mouth. It is easy to see at the mouth of the river how the swamps lying at the south end of the lake have been formed. Floating plants are carried down and collect together; reeds take root on them, an island is formed, and the deposit brought down by the river joins island to island. The depth at the entrance is 7 or 8 feet (dry season); once inside the river the depth increases to 3 fathoms, and from the lake right up to the falls of the Luapula in S. lat $10^{\circ} 30' 46''$ there is never a less depth than 10 feet. It is a magnificent river, from 250 yards to a $\frac{1}{4}$ mile in width, slow running with clear water, no rocks or sand banks. From Mweru up to the falls the rate of current is from 1 mile to $\frac{1}{2}$ mile per hour. It is a very similar river to the Upper Zambesi just above Zumbo, except that the current is much slower than that of the Zambesi. The latitude of the mouth of the Luapula at its entrance into Mweru is $9^{\circ} 25' 30''$.

Shortly before my arrival at the north end of Nyasa, that district had been visited by the cattle plague, which has been raging through East Central Africa during the past year. Practically, all the cattle of the north Nyasa country are cleared out, the mortality being over 90 per cent. On my way across to Tanganyika I found that parts of the country had been visited and portions had escaped. I had

heard that this disease had also attacked the wild game; I had no actual evidence of it, however, until I arrived at the south end of Lake Mweru. Here enormous quantities of game have died: for the first two days up the Luapula, where it passes through marshes, it is near the banks only of the river where good dry land is found. These banks are, or were, covered with game, mostly pookoo, buffalo, and lechwe. At the time of my passing up through these swamps the plague was at its height. Dead and dying beasts were all around. The first day I counted over forty dead pookoo within $\frac{1}{2}$ mile of my camp. Subsequently, on my return down the river, I saw scarcely any live game near the mouth, but the whole country was scattered with dead bodies. The natives from about Kazembe's were going with canoes, backwards and forwards, carrying the dead meat up to the villages beyond the marshes. Elephants, of which there are great numbers in these marshes, do not appear to have been attacked by the plague.

Mweru is a lake of gentle winds. There seems to be no prevailing winds as on Lakes Nyasa and Tanganyika. I found the winds mostly from the northern half of the compass, and these enabled me to use my sail for the first two days up the Luapula River. In S. lat. $9^{\circ} 48'$ I reached a narrow creek which entered the Luapula on its east bank, and which I was told by the natives led up to Kazembe's town. By poling and pushing I got the boat up it. This creek, leaving the firm land near Kazembe's, enters the marshes, and passing through them to the Luapula, forms a means of communication by canoe with the river. Following this creek up, I got my boat up to the dry land (the old shore of Mweru Lake) and thence went by land to Kazembe's town, which I reached on October 15th, and found that Mr. Kydd and the caravan had already arrived. Kazembe sent out the British flag to meet me, with a deputation conveying hospitable messages and greetings. On October 16th I was received by him with much state and ceremony. The recent death of Mshidi, the Chief of Katanga, had evidently made Kazembe somewhat afraid of Europeans, but knowing me of old, he soon became reassured. Lunda, Kazembe's country, is a rich agricultural country, very different to Itawa. Lunda is well watered by permanent streams of running water, and the vegetation is much more luxuriant than in the countries north of it. The tsetse fly, however, is very plentiful throughout both Lunda and Itawa. East of Lunda lies the Awemba country, into which it is difficult to enter at present, owing to the desire on the part of the inhabitants and of the Arabs to keep us out as long as possible. The Awemba country is a great feeder of the slave trade. Caravans can always obtain slaves there.

On October 17th I left Kazembe's, and sending the caravan on overland to meet me on the Upper Luapula, I rejoined the river in the boat, and followed it to the south. The latitude of Kazembe's present town is $9^{\circ} 48''$, some 8 miles south of the Mbereze River. The swamps lying to the west of the town, and which on my first journey I took to be part

of Mofwe, are in reality south of the Mofwe lagoon. This lagoon, however, is gradually filling up, and will before long form part of the marshes. On the shore of the Mofwe lagoon are visible the banks and ditches which surrounded a town where a previous Kazembe had resided. The Kazembe of to-day is not such a great chief as the Kazembe of one hundred years ago, when Dr. Lacerda's expedition visited this country; and I cannot help thinking that the accounts given by Pinto (the historian of that expedition) are much overdrawn. Still, there is far more ceremony and State at Kazembe's than at any other part of Central Africa I have been in. Ascending the Luapula I reached the limit of the swamps in lat. $9^{\circ} 55'$, and from here upwards for some miles were dry plains. There is, however, one point in the marshes of the Luapula where the high ground on the west approaches the river, a tongue of land; it reaches the river in about lat. $9^{\circ} 44'$, and here is a village of Mshidi's people cut off by the Luapula and the intervening swamps from Kazembe's people. In lat. $10^{\circ} 4' 1''$, the first of Kazembe's villages on the Luapula was passed on the east bank. From here upwards the country on that bank is undulating and wooded with gentle hills, and villages of Kazembe's people are met with here and there up to the Falls. On the west bank the population is much smaller, but now numbers of Mshidi's people are giving in their allegiance to Kazembe, and are building villages on the west bank. In lat. $10^{\circ} 12'$ a large river joins the Luapula on the east bank. I conclude that this must be the river marked on existing maps as the Luongo. The natives, however, call it the "Ruki," and do not know the name Luongo. Above the Ruki plains the Luapula is very beautiful, passing through gently rising, wooded hills; the water is always deep and clear. The inhabitants of the villages on either bank are simple, friendly people, timid at first, but eager to barter produce as soon as they found we had no wish to hurt them. In lat. $10^{\circ} 22' 16''$ there are some remarkable red cliffs on the west bank.

On October 22nd, soon after starting, I heard the sound of rapids, and presently reached the head of navigation of the Luapula in lat. $10^{\circ} 30' 46''$. The river here rushes through great masses of rock. In places the water has worn channels for itself below and between the rocks, and portions of the river are for some way bridged by them. The water was extremely clear (dry season). Here and there were pretty little bays with bright, sandy beaches. I found that a fine, clean-looking fish of from one pound to five pounds took eagerly both a spinning bait and a fly, and I had some really excellent fishing, making flies with red and white calico, and using a long, springy bamboo as a rod. As I had, however, no reel, and no landing net, I lost many fish. I christened the falls, in the absence of any special native name for them, "Johnston Falls." I put the caravan in camp here for a week, and took three short journeys; one for 10 miles up the river, which I found to be nothing but a succession of cataracts

one to the east for 12 miles; and one to the west for 8 miles. The country to the east I found dry and thinly forested, gentle rises and descents. Four days east of Johnston Falls, I was told, were the "Mchinga" (high range of mountains) and one to two days beyond that was Bangweolo Lake. The name Bangweolo is not known, however, the lake being spoken of as the "Mweru of the Awiza." The Awiza people are said to live on islands in the lake. Mshidi's old town was said to be six days' journey west from Johnston Falls. This point, therefore, forms a very central position, as in addition to being so near to the Bangweolo and Katanga Districts, water carriage to Rhodesia puts it within seven days' land journey of Tanganyika. At the Falls I bought seven large canoes, in which, and in the boat, I stowed all the loads of the expedition, and in this manner I transported everything by water all the way back to Rhodesia Station. This enabled the carriers to travel without loads, and therefore with speed. On October 29th, small-pox broke out in my camp—two cases, a Zanzibari and an Atonga native. I left them in one of Kazembe's villages in charge of the chief, with plenty of cloth to provide for their wants, and to bring them home when recovered. I had originally hoped to return to Karonga by way of Lake Bangweolo, and by the Chambezi River through the Awemba country, but finding that the time at my disposal would not allow of it I decided to return by way of Tanganyika. I left Johnston Falls, therefore, on October 29th with the steel boat and seven canoes, the caravan going overland.

The rains commence much earlier on Mweru and the Luapula than in Nyasaland. Heavy rains began with us on October 23rd, and until the middle of November we had constant rain. There were some terrific thunderstorms on my way down the Luapula. Passing through the marshes I saw numbers of elephants, and shot seven. It is a very difficult country to shoot in, however, as the elephants when disturbed or wounded go straight into the marshes where it is impossible to follow them. One sinks in mud and water sometimes to the neck, leeches are plentiful, mosquitos thick, the razor-like grass cuts one's hands, and minute spears on the grass stalks pierce any part of the skin they touch.

I re-entered Lake Mweru again from the Luapula on November 6th, and coasting along its southern shore to the Chimbofuma inlet, followed up the east coast to Rhodesia Station, which I reached on the 9th, thus completing the circumnavigation of the lake. The Kalongwizi River which enters Mweru from the east, has thrown out an extensive delta into the lake. This consists mostly of papyrus swamp, but the beach is sandy. Very little water comes down the Kalongwizi in the dry season. On the bar there was 18 inches of water: inside, 1 fathom.

From the time of leaving Kazembe's village to arriving at Rhodesia no food was procurable, and on from Rhodesia until I reached Mkula's not a grain of food could be bought. The caravan was thus for three

weeks without any food except the meat we shot. Fortunately, of game there are unlimited quantities throughout those districts, and the men were never long hungry. Any caravan passing through this piece of famine country, whose leaders were not keen about shooting, would starve. Having joined the caravan at Rhodesia, I travelled east to Mkula's, leaving the station on November 11th and reaching Mkula's on the 16th.

From Mkula I travelled to the head of Kamba Bay (Tanganyika), leaving Sumbu to the north. The road from Kamba to Mkula is better than that from Sumbu, and there is more water on the way. From Kamba I went on to Abercorn Station, calling at Kabunda's, the Baluchi. I also called at Niamkolo, the Tanganyika Station of the London Missionary Society. Mr. Swann, the missionary in charge there, had recently been with the mission steamer *Good News* to Ujiji. He saw Rumaliza there (Tippoo Tib's partner), with whom he has been on friendly terms for some years past, and was told by him that the Arabs are much exercised in mind by the war troubles east and west of Tanganyika, and that it was possible that they might all join in a war against the Congo Free State and the Germans. Ujiji was being fortified by Rumaliza, who had taken down the German flag he had for some time flown.

On November 25th I left Abercorn and travelled to Fwambo, where I was delayed two days, and thence hurried on as fast as possible towards Nyasa, in the hope of catching a steamer at Karonga, and I sent messengers on ahead to delay the steamer should she reach there before my arrival.

I arrived at Karonga on December 8th, found the steamer there, paid off my carriers, and left on the 9th for the south. I reached Fort Johnston on December 16th.

All the natives I took on my journey, except two left behind to recover from small-pox, returned in good health. I had no losses by death. Throughout the journey I never had occasion to fire a shot nor to use any force, and was everywhere well received and well treated.

I took no observations for *longitude* on this journey.

MR. ASTOR CHANLER'S EXPEDITION TO EAST AFRICA.*

THE following letter dated Hameye, on the River Tana, March 8th, 1893, has been received from Mr. William Astor Chanler, the leader of the expedition towards Mount Kenia in East Africa :—

I enclose you a map made by Lieut. von Höhnelt, of a journey I have just made. The map speaks for itself. It is made with scrupulous accuracy and is the result of many hours' hard labour. The positions are all

* Map, p. 576.

based on the position of Hameye, which has been fixed by a series of star occultations.

A few words, however, may not be amiss. The Mackenzie River is about 12 yards wide and nowhere more than 3 feet deep. It flows for the first 15 miles through alluvial soil mixed with occasional lava blocks; thence through gneiss. The head-waters of the Mackenzie swarmed with game of all sorts. The country lying to the north of the Jombéné Range and bounded by the Guaso Nyiro is strewn with lava blocks. The Guaso Nyiro flows in a gneiss bed, except in the neighbourhood of "Chanler Falls," where a mass of lava has forced itself into the course of the river. It is over this mass that the river pours in two streams. The fall is something over 50 feet high. Below the falls for 2 miles the river flows between sheer walls of black lava. The Guaso Nyiro is here 80 yards wide and varies from 5 to 8 feet in depth. In the neighbourhood of the "Marisi el Lugwa Zambo" Plateau, the river ceases to flow through gneiss, and flows from thence on through alluvial soil. The "Marisi el Lugwa Zambo" Plateau is purely volcanic. It rises abruptly from the plain 500 feet. The Guaso Nyiro, in its passage through the plain, dwindles away till at the last point we saw it it was barely 10 yards wide and only from 1 to 2 feet deep. The Lorian Swamp seemed of great extent and was filled with high reeds. The country to the north of Lorian seemed undulating desert covered with scrub. We saw not one native from Hameye to Lorian except on the Jombéné Range. This whole tract is uninhabited. We saw in the neighbourhood of the Marisi plateau zeribas which had held people having camels and goats—probably Randhilé, who visit this country during the rainy season. The Randhilé two years ago visited and established trading relations with the natives of the Jombéné range. They had many camels, my informant said. We saw many zeribas of Wandorobbo. We got a capital view of Mount Kenia from the western portion of the Jombéné Range. The mountain looked waterless on this, the north-east side. It was covered with many craters. The forest belt passed very high, say 10,000 to 11,000 feet. On the eastern portion the forest extended to the plain. The lower slopes were grassy. The Jombéné Range is very fertile and is thickly inhabited. The Wa-msara inhabit the western slopes. They are warlike, and do not pay so much attention to cultivation as the Wa-embe, who inhabit the eastern portion of the range. Both these people are offshoots of the Kikuyu race. They speak a dialect of the Kikuyu language, but use many Masai and Mkambu words. Many Wakamba and Wakwari are settled among them. The Wa-embe are industrious cultivators; they grow sweet potatoes, yams, cassava, beans, sugar-cane, and millet of two sorts. They are fast destroying the forest with which this range was evidently formerly covered. We start to-morrow for the north *via* Mount Kenia and the eastern slopes of the General Mathews Range.

NOMENCLATURE OF THE OCEANS.

It is interesting in connection with the nomenclature of the greater divisions of the hydrosphere to remember that a Committee was appointed by the Royal Geographical Society in 1845 to deal with the whole matter. This Committee met once, and was adjourned on January 27th, 1845, but there is no record of a subsequent meeting. The sub-divisions of the oceans now generally adopted date from this meeting, and as very full minutes of the discussion have been preserved, but were never published, it is desirable to place them on record.

1845.

Copy.

January 27th.

The Committee appointed by direction of the Council of January 13th to take into consideration the divisions of the ocean and the respective limits of these divisions met this day at two o'clock, there being present, Mr. Murchison, President, in the chair, Sir G. Back, Captain Beaufort, Sir John Franklin, Mr. Greenough, and Captain Smyth; Mr. Arrowsmith being also present.

The President having opened the business of the meeting, Mr. Greenough observed that the present divisions of the ocean and the names they received were very arbitrary, and that a systematic arrangement was desirable. He despaired of changing the common parlance in these matters, but was of opinion that geography, like other sciences, should have its philosophical system, and that, as in the cases of the Linnæan and Jussieuian systems of botany, etc., so a geographical system, if found to be a good one, would be received by the scientific world; particularly if accepted and encouraged by those departments, such as the Admiralty, &c., whose sanction would go so far in such matters, and that what in the beginning would be confined to the scientific would become familiar to the many to great advantage of the science itself and of general knowledge. With regard to the particular object of the meeting, and in conformity with his conviction that a partial change in the present divisions of the ocean would be attended with no good results, he had prepared, in order to submit to the consideration of the meeting, a totally new division of the ocean into zones.

The President was of opinion that no great changes of the kind contended for by Mr. Greenough, however good they might be, were likely to be received unless brought forward prominently at a meeting of the British Association.

Mr. Greenough instanced Linnæus, Cuvier, &c., as individuals whose systems had been universally adopted.

Captain Beaufort thought that, though the precise limits of the several oceans were not accurately defined, they were sufficiently so for all practical purposes. He saw no objection, however, to defining them more precisely; but was decidedly opposed to new names, such as those proposed by Mr. Greenough. He thought the change uncalled for, and, even if admitted by ourselves, was not likely to be adopted by other nations.

Captain Smyth regretted the very vague signification of the term "South Sea," and was of opinion that without any appearance of innovation the following divisions might be settled, viz.—The Arctic Ocean and the Antarctic Ocean; the North Atlantic and South Atlantic; the North Pacific and South Pacific; the North Indian* and South Indian Oceans. He nevertheless concurred with Mr. Greenough in the desirableness of a systematic arrangement of the Ocean founded upon philosophical

principles, and saw no reason why there should not exist at the same time a philosophical and a popular arrangement of the facts of physical geography.

Sir George Back thought it advisable to retain the existing names of the oceans, but opined for a determination of their respective limits. In this opinion Sir John Franklin concurred.

The Secretary read some notes he had made, showing that both the divisions of the oceans and their respective limits were differently determined by different authorities abroad and by ourselves.

Sir John Franklin, Mr. Arrowsmith, and other gentlemen present then explained their several views as to the limits of the several oceans as popularly known. Finally the general opinion entertained was that the present names of Arctic, Antarctic, Atlantic, Indian, and Pacific Oceans be retained; that the limits of the Arctic and Antarctic Oceans be respectively the Arctic and Antarctic Circles; that the limits of the Atlantic on the north and south be the Arctic and Antarctic Circles. That its western limit be the coast of America as far south as Cape Horn, and thence prolonged on the meridian of that cape till it meets the Antarctic Circle; that its eastern limit be the shores of Europe and Africa as far south as the Cape of Good Hope, and thence prolonged on the meridian of Cape L'Agulhas, till that meridian cuts the Antarctic Circle; that the Indian Ocean do extend from India and Persia on the north to the Antarctic Circle on the south; that its western limit be the shores of Arabia and Africa as far south as Cape L'Agulhas, and thence along the meridian of that Cape to its intersection with the Antarctic Circle; that its eastern limit be the west coast of the Birman empire and a part of the Malayan Peninsula, the west coast of Sumatra, Java, Timor, and Australia, as far as the southernmost point of Van Dieman's Land, and thence continued along the meridian of that point to its intersection with the Antarctic Circle; that the Pacific do extend from the Arctic Circle on the north to the Antarctic Circle on the south; that its western limit be the east coasts of Asia and of the island of Sumatra, the northern shore of Java, Flores, and Timor, and the coasts of Australia from Melville Island round to the southern point of Van Dieman's Land, and along its meridian to the Antarctic Circle, and that its eastern limit be the west coasts of America and the meridian of Cape Horn as far as the Antarctic Circle. It was further agreed that the Atlantic and Pacific Oceans be sub-divided into three portions: a northern and southern and an intertropical, and that the Indian Ocean have but two divisions—an intertropical and southern.

This arrangement being agreed upon, Mr. Greenough and Captain Smyth were requested to concert together on the subject of a scientific system of classification of the oceans, seas, gulfs, bays, &c., to be subsequently submitted at their convenience to the consideration of the Society.

(Signed) Rob. I. Murchison.

THE PHYSICAL AND INDUSTRIAL GEOGRAPHY OF CALIFORNIA.*

By Professor E. W. HILGARD of San Francisco.

THE great change which has taken place in the physical conditions of California since the days of Bret Harte and Mark Twain is apparent from the fact, that for some time the only method of goldmining possible in certain districts, viz., the

* Report of paper read at the Berlin Geographical Society, February 4th, 1893.

hydraulic, has been prohibited by law on account of the injury caused thereby to the agricultural interests. The State of California has a coastline of about 700 miles, an average breadth of 200 miles and a superficial area of about 156,000 square miles. This great area is peopled by only 1,300,000 souls, of whom 250,000 inhabit the city of San Francisco. The tempering influence of the sea causes a much greater equability of climate as between the north and south than might be expected having regard to the length of the country; on the other hand the climate changes very rapidly as one proceeds from east to west. In the east the gently rising Sierra Nevada forms a natural boundary. It is well wooded, from about 3600 feet, principally with conifers; the foothills are sparsely clothed with pines, oaks, and underwood. The coast range is a mountainous region with an average breadth of about 62 miles, which, in contrast with the very simple chain of the Sierra Nevada, consists for the most part of two or three broken parallel chains, seldom rising over 3300 feet in height, between which run numerous river valleys to the north-west, some of them broad and very fertile. The rounded ridges of the coast chains are as a rule only sparsely wooded, but the forest region between the outer and inner coast ranges in the northern half of the country, which is the home of the valuable red-wood (*Sequoia sempervirens*), is an exception. The coast is rocky; the wind, blowing almost always from the sea, renders navigation dangerous, and there are only a few good harbours. Between the Sierra Nevada and the mountains of the coast lies the great central valley, which is about 400 miles long and 62 miles broad. This central valley is a well-cultivated district, comprising nearly one-ninth of the entire State, and is almost throughout, where watered, of remarkable fertility. Flowing through it from the north is the Sacramento River and from the south the San Joaquin; the two rivers, after uniting about halfway down the valley, turn westwards, and then after forming three lake-like extensions (the bays of Suisun, San Pablo, and San Francisco) finally pour their waters through the Golden Gate into the sea. All the more important affluents of this river system flow down in deep cañons from the Sierra Nevada. The great valley was originally a fresh-water lake, which, before the gap of the Golden Gate existed, discharged its waters southwards by means of the Pajaro River into the Bay of Monterey. The remains of this lake are seen to-day in the Tulare Lake, but this lake is quickly drying up, as the utilisation of the streams for irrigation leaves an ever-diminishing quantity of water in its basin. The great valley is shut off on the south by a mountain mass, the Tehachipi Range, formed by the conjunction of the Sierra Nevada and the coast range, on the other side of which lies the Mojave tableland at a height of about 2000 feet, and on the further side of that, the region of South California proper, the chief centre of the orange cultivation. The western part of the Mojave plateau presents wide expanses of country, capable of being cultivated, if artificially irrigated.

The prevailing wind, except during the winter months, is the south-west wind, which blows off the sea cooled by the Alaska current, and lessens the heat very considerably. In the central valley these south-west winds enter through the Golden Gate and blow in the northern part as south winds, and in the southern part as north winds. North of San Francisco, Cape Mendocino forms a climatic dividing-line, for on the other side of it the north-west winds prevail, and the rainfall increases considerably. In the winter the winds are very variable; the rain storms spread with a south wind from Paget Sound to the south. The north winds correspond with the sirocco of the Mediterranean; they occur always when the sky is clear and the atmosphere very dry, and are so hot at times in the summer that the crops are burned up. These winds last from one to three days and are most frequent in June and September; in some years they are never experienced.

The climate of the coast is very cool and equable; the difference between the mean temperatures of the summer and winter in San Francisco is only $3^{\circ}6$ (Fahr.). Thick mists are frequent, but it is only in winter that they extend into the interior and to the foothills of the Nevada; in summer they melt away on the slopes of the coast range. In the great central valley the temperature rises sometimes as high as 100° (Fahr.) and in the summer it stands daily at from 86° to 95° , but owing to the great dryness of the air this heat is not burdensome, and sunstroke is unknown. In winter the lowest night temperature falls often below freezing-point and even as low as $28^{\circ}4$ (Fahr.); at times a little snow falls, but melts quickly. In San Francisco snow is very rarely seen. The climate just described extends up to an altitude of from 2000 to 2300 feet to the foothills of the Nevada and similarly to the coast mountains. In South California the heat as well as the cold is less, and even on the coast the mists are less frequent, because the Alaska current at Cape Conception trends away somewhat from the coast. Semi-tropical fruits can consequently be grown there with greater success.

In California, south of Cape Mendocino and north of the Tehachipi Mountains, almost the whole rainfall of the year occurs in the six months from November to May. A five months' drought is nothing to be alarmed at in California. "A green winter and a brown summer" is the normal state of affairs. The cereals are sown from November to April, and according to circumstances the crop is turned into hay or corn, for there are no meadow lands except those created by artificial irrigation. To the south of the great valley the rainfall is very small; at Bakersfield from 4 to 6 inches only, but it increases on the east side of the valley fairly regularly up to $19\frac{1}{2}$ inches at Sacramento, and at the north end to nearly $27\frac{1}{2}$ inches. The rainfall decreases westwards and is about 4 inches less than that of the eastern side of the valley. In the coast range the rainfall varies according to the formation and direction of the openings of the valleys, so that there are numerous "local" climates, which present special facilities for particular kinds of cultivation. In North California the rainfall reaches as much as $78\frac{1}{2}$ inches, and in the Sierra Nevada the increase of rainfall with the altitude proceeds at the rate of about 1 inch per 100 feet. In spite of that the character of the foothills up to 2350 feet is almost like that of the great valley. Higher up, say up to 4000 feet, fruit is extensively grown; grapes, peaches, pears, and apples. Higher up still the timber and mining industries, together with sheep-breeding, are carried on. The cultivation of fruit and of the vine flourishes in the valleys of the coast range, which in some parts are thickly populated; in many places asphalt, petroleum, quicksilver, and peat of the best quality, are obtained. In addition dairy-farming is extensively pursued, and good breeds of cows and horses are reared. Further south, beyond the watering-place of Santa Barbara, large quantities of maize and beans are cultivated, and swine-breeding is a flourishing industry. The effect of artificial irrigation on the arid soil of the central valley is simply marvellous. For instance, the Plain of Fresno, which fifteen years ago was as bare as a threshing floor, is now one huge vineyard and fruit garden, intersected by thousands of irrigating channels, and full of fine country houses. Whereas in the Mississippi States about 50 acres of country are reckoned necessary for the support of one family, in California $12\frac{1}{2}$ are sufficient. Wheat is now only cultivated where irrigation is not necessary. On account of the extreme climatic conditions of the east of the United States vine cultivation is only practicable in California; the cultivation of raisins and the production of sweet wines make every year enormous advances. Dry wines grow specially well in the valleys of the northern coast range, in Sonoma, Napa, Sta. Clara. California possesses a further

monopoly in French plums, so much so that this fruit has almost entirely ceased to be imported from France; also in apricots and figs, the latter being produced in the Eastern States as green fruit only, whereas in California the Smyrna figs do well as dried fruit. In the State there are about six million orange and lemon-trees, and thousands of acres are covered with olive-trees. The cultivation of the sweet turnip has also made great strides. In suitable places date-trees grow splendidly; and through the introduction of ostrich-breeding the home demands for feathers have already been met. In North California hops and barley flourish in a remarkable manner, and beer brewing has consequently been much developed in the cooler regions of the Sierra. Generally, there is probably no market in the world where such a choice of home-grown products of various climates is to be found.

THE INFLUENCE OF THE NEW WORLD UPON THE OLD.*

By Professor Dr. J. REIN.

COLUMBUS, having brought to a partially successful issue, in spite of the most severe discouragement, the earlier scheme of Toscanelli to reach the east by sailing west, rendered to Europe an immortal service. The discovery of the sea-route to India, and the first circumnavigation of the Earth soon followed the discovery of America. In the intellectual life of Europe came, at the same time, the Reformation. Civilisation thus received new impulses; it was launched in a new direction, and brought to develop quite new forces. The material conditions also underwent a notable change, as wants grew with the means of satisfying them. North America soon became the great field of human energy, and here began a struggle for life unlike any which had ever before taken place; not the struggle between nations led by their chiefs, but the struggle of the bold and enterprising exiles from all parts of Europe, who overcame the difficulties of their surroundings, and learned to live without any other human protection than their own. Orderly states ultimately grew out of chaotic beginnings, during which the right of the strongest often prevailed. Virgin forests, prairies, and unproductive steppes were transformed into rich fields, and machinery for furthering labour was planned and made. The stimulus to inventiveness produced a crop of "Yankee notions." It was on the waters of the majestic Hudson River that the first steamer plied commercially; and on its shores the first Morse telegraph was brought into action.

The influence of the New World upon the material conditions of life in the Old World has been very varied. For most inhabitants of Europe, and even for the Maoris in far-off New Zealand, potatoes have become an every day food; Indian corn is even more widely spread; and tobacco has conquered the whole world. Many other useful plants have introduced considerable changes in our manners of life. Cacao, vanilla, logwood, mahogany, and other useful or decorative timbers, as well as the many ornamental plants of our houses and gardens, are among them. Among animal products there are guano and the wool of the alpaca and the vicuna from South America, cochineal from Mexico and Guatemala, the furs and the fishes of North America. American cotton affords a living and clothing for many nations of the Old World; American wheat, American wool, and American meat are competing with the farm products of all Europe; but they save us from

* Abstract of the opening address delivered before the tenth Congress of the German Geographers at Stuttgart, 1893.

high prices and scarcity. However, the effects of the mineral treasures of America upon our life have been even more rapid, deeper, and therefore more evident. American gold, silver, copper, and lead, petroleum and Chili saltpetre have greatly affected the markets and exchanges of Europe.

These influences of America have acted chiefly during the last half of this century. They are so well known that it is sufficient to simply name them. But there are other consequences of the discovery and conquest of America which, although less evident, are perhaps of greater importance. To appreciate them we must return in thought to the day when Columbus came back from his first and chief journey. He landed in Palos on March 15th, 1493, from the smallest of his three ships, exactly thirty-two weeks after having left the same place.

The news of his return and discoveries rapidly spread. His journey to Barcelona was a triumphal march. Soon arose the rivalry of the Portuguese and their fear of being hampered in their enterprises in Africa. In consequence, Pope Alexander VI., himself a Spaniard, promulgated his famous bull dividing the Eastern World—over which the Portuguese held all rights of discovery—from the Western, which was similarly held as the exclusive property of Spain. The successive shiftings of the line of demarcation, which at that time could not be accurately determined, led to results of world-wide importance. Brazil thus became a Portuguese colony; the first circumnavigation of Fernão de Magalhães took place, and the treaty of Zaragoza (1529) was concluded, by which treaty Portugal paid the foolish sum of 350,000 ducats to Spain for maintaining its rights upon the Molucca Islands.

With the discovery of America and the sea-route to India began the glorious period for Spain and Portugal, but their material and moral decay began also. The eager thirst for glory and religious fanaticism made Spain the owner of half the New World, and brought to her incredible treasures of gold, silver, precious stones, pearls, and other forms of wealth. The discovery and the conquest of the new lands having been made at the expense of the Crowns of Castile and Leon, the industries of this part of Spain were favoured to the detriment of those of the lands of the Crown of Aragon. When the woollen-cloth manufacturers of Toledo, Valladolid, Segovia and Cuenca, could not supply the growing demands of the new settlers in America, it was not Valencia or Barcelona who came to their aid, but Genoa and the Netherlands. The same happened with other industries. Instead of leaving them to develop free under the increasing demand and the rise in prices, all sorts of obstacles were put in their way, and Louis annihilated them. When complaints rose about the high prices of various articles of export, Philip II. prohibited the export of leather goods, and established a maximum price for woollens, thus compelling the manufacturers to limit their productions to inferior goods. But this was not the only means of favouring foreign competition; nor were the means limited to the earthly part of man's life. By the end of this period Spain was depopulated, turned into a desert, brought to misery, devoid of any one of the elements which might enable a nation to rise morally and materially. Then came the Inquisition with its manifold terrible consequences.

In those times, when distinction was not made between piracy and war, the bold Dutch and English privateers who had plundered most of the Spanish-American cities, were received at home with the greatest respect. An instance of this kind is the history of Sir Francis Drake, the first English circumnavigator, and of his uncle, Sir John Hawkins, to whom the importation of potatoes to Europe is ascribed. With them, and with Sir Walter Raleigh, the first lasting influence of the New World on the British Isles begins. True that the two Cabots (Giovanni and Sebastiano Gabotto), in the service of Henry VII., had discovered Newfoundland

and the American continent in 1497; but little account was taken of the discovery, and it only stands in the diary of the miser King, who mentions under August 10th, 1497, the small importance attached to the discovery: "To him who found the New Isle, 10 l." Only the Portuguese Cortereals who reached Newfoundland three years later attracted the attention of their compatriots to the rich fisheries of the *Ilhas de Bacalhao*s, which Lord Bacon valued later on more than all the gold of Peru. The fishing was thus opened by Portuguese from Aveiro, who were joined later on by Basques and Frenchmen, long before the appearance of the English in the same waters.

Although Newfoundland is considered as the oldest possession of England in the New World, and although Sir Walter Raleigh attempted a colony in Virginia, still the first lasting English settlements date from 1607 only. The first colonisation of the low West Indian Islands, neglected by the Spaniards as they had no gold, falls in the same period. With religious freedom, moral earnestness and work, the immigrants, both Catholic and Protestant, began to build up their new country.

And what a difference now! The United States separated from their mother-country forty years before the Spanish colonies. But their intellectual and commercial connection with the mother-country has been maintained and ever strengthened. Of the exterior trade of the Spanish Republics, which attains £136,000,000, only one-fiftieth part is with Spain; while the lion's share of the exterior trade of the United States—that is, £126,000,000—comes to the United Kingdom; and next to it comes Germany, with £36,600,000. This is in time of peace; but the state of affairs in times of war are equally worth notice. During the War of Secession in 1861–65, the cotton exports from the States sank to $\frac{1}{3}$ of what they were in 1860, and the price of the pound of cotton rose to eight times its previous value. Many of us must still remember the influence of this cotton-famine which provoked in the remotest colonies of Britain the awakening of the noblest features of national character—an unlimited readiness to sacrifices for mutual support. Another consequence of the same war was that it gave a formidable impulse to cotton culture in Egypt, India, and elsewhere, which resulted in wild speculation in land in India, ending in a commercial crisis when peace was re-established in the Union, and the prices of cotton rapidly went down.

In the intellectual progress of mankind, the United States stand in the first rank, and they have their large part in having promoted the knowledge of the Earth. The opening of Japan and the careful investigation of the coral reefs of the South Sea are due to expeditions from the States. The North Americans were the first to send Stanley to Africa, and they took a lively part in the explorations of the Polar regions, deep-sea explorations, the study of climate, and astronomical discovery.

And finally, comparing the Columbus Exhibition in Spain with the World's Fair in Chicago, it is interesting to observe how the one only looks to the past, while the other is given to the present and to the future, and will contribute to establish a new bond between all civilised nations.

THE EARTH'S SURFACE AND SOLAR ENERGY.

THE newer deductive methods introduced by the leading German and Austrian meteorologists continue to yield abundant and excellent fruit. Closely following his masterly analytical studies on the thermodynamics of the atmosphere—of which the sense has recently been presented to the strictly English student by Professor

Waldo—Dr. von Bezold has communicated to the Berlin Academy of Sciences the first of a series on radiation. Although this paper is professedly only preliminary and a setting of matters mathematical into order, several facts of great importance are noted; as, for example, that in comparing the action of radiation on land and sea we ought to compare equal volumes, not, as is usual, equal weights of earth and water, and that, if we do so, the usual explanation of the contrast between oceanic and continental climates, as due to the different heat capacities of these substances, breaks down. On the other hand, the influence of evaporation is shown to be enormously greater than is usually supposed, a most discouraging result in view of the want of convenient methods of measuring amounts of water evaporated.

The discussion concludes by dividing the subject under three heads: First, total radiation and reflection; second, gain and loss of energy in particular sections of the atmosphere and of the Earth's surface; third, convection or transference of heat by air and water. Of these the first and most difficult has already been worked at by many investigators, and Dr. von Bezold proposes to restrict himself to the second and third. Following this arrangement, the latter part of his paper deals with the distribution of heat energy in a column of earth of unit horizontal section, extending from the surface downwards to a point where changes of the atmospheric temperature cease to produce sensible effects. Concerning this we note as important to observers of underground temperature, the need for information as to thermal properties of the soils in which such observations are made.

Similar considerations have already produced results of general interest in the hands of Dr. W. Zenker, whose methods—different from and less rigorous than those of Von Bezold—are described in the *Meteorologische Zeitschrift* for October, 1892. Dr. Zenker calculates, for belts of latitude, what the mean air temperature *ought* to be under certain assumed conditions of radiation, and compares the results with mean temperatures observed. The differences which occur—some positive, some negative—are found to afford at least a rough measure of the transference of heat from one part of the Earth's surface to another, although the considerations suggested by Von Bezold show that several other important factors are involved. In *Petermanns Mitteilungen* (Bd. 39, No. 2), Dr. Zenker gives a map showing the results of an application of this method to the distribution of temperature over the sea, and finds himself justified in drawing therefrom the following conclusions. The air is warmer than the computed temperature only when it either lies over water which has been moved from lower to higher latitudes, or has come in contact with land in latitudes lower than 40° ; and colder when it lies over water which has moved from higher to lower latitudes, come in contact with land in latitudes greater than 40° , or proceeds from one of the great continental areas of cold. Each of these conditions of abnormality is extremely significant. The effect of transference of water is well marked in the North Atlantic. The air warms and cools faster than the water, nevertheless the mean air temperature is in excess where air and water move together northwards, and in defect where both move southwards, except where, during winter, the north-westerly winds from the cold area over Canada reduce the temperature, and give rise to the Newfoundland fog-banks.

In applied meteorology these results give promise of much progress; and in particular we may notice the hint given with regard to the relation of climate to the distribution of plants and animals. Where the temperature of the air depends upon direct radiation, as it does to a very great extent at inland continental stations where the land is level and there is no very active horizontal circulation of the atmosphere, it may be assumed that such temperature is at least an approximate measure of the sun's power, representing a certain sum of heat and light rays. But if the air temperature is abnormally raised or lowered through

transference by wind or other disturbing cause, the balance of heat and light is obviously disturbed, and the temperature becomes a different measure of the solar energy, the former case being indeed analogous to that of the climate of a hot-house. Thus, for example, A. de Candolle found that certain plants required a markedly larger sum of "accumulated temperature" to ripen them in the north of Scotland and the Orkneys than in more inland continental regions, which it would now seem is due to the fact that part of the sum represented artificial heating through south-westerly winds and oceanic influences, a part to which there is no corresponding supply of light and other rays. Dr. Zenker's investigations may enable us to calculate such corrections for sums of accumulated temperature as will render this method suitable for general application to questions of phenology.

THE MONTHLY RECORD.

THE SOCIETY.

Legacy by the late Earl of Derby.—The late Earl of Derby has left to the Society a legacy of £1000, free of duty. The late Earl had been a Fellow of the Society for forty years.

'The Geographical Journal.'—The June number concludes the first volume of the *Journal*. It has been considered expedient, owing to its increased size, to have half-yearly instead of yearly volumes. The success of the *Journal*, so far as increased sale is concerned, has been very satisfactory.

Lieutenant Peary.—We have received a telegram from Lieutenant R. Peary, U.S.N., in which he expresses regret that his intended visit to Europe cannot take place. Mr. Peary had promised to give an account of his discoveries in Greenland during his recent expedition at one of the Society's meetings this session; and only the urgent need of his personal assistance in preparing for his new and greater journey has prevented him from fulfilling his word. The preparations for the new expedition have been retarded by the somewhat sudden death of Captain R. Pike, the Newfoundland whaler, who so successfully took Lieutenant Peary to his destination, and returned for him last summer in the *Kite*.

Dr. Nansen's Expedition.—Dr. Nansen's preparations are now practically completed, and he sails on June 20th from Christiania, to make his way by the Kara Sea to the New Siberian Islands, where he hopes to get his vessel, the *Fram*, wedged into the northward drifting pack, and so to be carried across the Polar Basin.

EUROPE.

Entrance to the Mersey.—The Report of the Acting Conservator on the state of navigation of the River Mersey for 1892, contains some notes on a detailed survey of Liverpool Bay made during the

year by the Marine Surveyor, which has brought out some significant points in relation to the variations in depth in different parts of the bay since 1890, the date of the last survey. These changes are not directly caused by the dredging operations carried on in the river, but represent more or less accurately the net result of the action of wind and tide during the period. On the whole, the 30 feet contour line outside the bar has advanced some 350 yards to the north-westward, and the 18 feet contour some 200 yards outwards, since the last survey. Some idea of the magnitude of the "harbour works" of the Port of Liverpool may be obtained from the statement of the report that in 1892 over 1,000,000 tons of sand were removed from the cutting across the bar alone. This amount is nevertheless insufficient fully to maintain the channel 1000 feet in width and 3000 feet long at the desired depth, and the Conservancy are about to bring into operation a dredge capable of loading a cargo of 3000 tons of sand, from depths of 20 to 45 feet, in three-quarters of an hour. The report includes a plan showing the present condition of the works of the Manchester Ship Canal. Water has already been admitted to a point near the River Weaver, and a port has sprung up there during the past six months, which, from its advantageous position for loading Weaver salt, has been named Saltport. Cargoes amounting to 103,957 tons have already been discharged and loaded at Saltport, and the gross total of traffic carried over the opened portion of the Canal (about 11 miles), was 1,124,594 tons during 1892. Out of the total length of $35\frac{1}{2}$ miles of canal, only 1 mile of excavation remains to be completed.

Survey of French Lakes.—In pursuing his researches on the smaller lakes of Eastern France M. Delebecque has investigated the connected series of the Lacs des Sept-Laux in Isère. These form a chain of five on one side of the Col des Sept-Laux and of four on the other. The water passing through these lakes undergoes a series of decantations and, leaving the sediment behind, becomes more and more transparent, the visibility of a white disc in three consecutive lakes extending to 25, 34, and 44 feet of depth respectively. The little Lake of Girotte in Savoy, situated at a height of 5700 feet between the valleys of Beaufort and the Bon-Nant, showed some very curious conditions. Its maximum depth is 54 fathoms, its length about three-quarters of a mile, and its width about one quarter of a mile. Unlike all the other Alpine lakes its water was not found coldest at the bottom in summer. In July the surface temperature was 63° F., the water cooled rapidly to 14 fathoms, where it was between 39° and 40°, then rose again gradually to 45° at the bottom. The chemical nature of the water also differs greatly at different depths. That at the surface contains less than seven parts of solid matter in 100,000 of water, that at the bottom as much as fifty-two parts, the solids being mainly sulphate of lime. The deeper water also contains a perceptible

amount of sulphuretted hydrogen. This presents a certain resemblance to the conditions in the Black Sea (p. 49); but M. Delebecque does not suppose the sulphuretted hydrogen to be the result of decomposing organic matter. He inclines to believe that water charged with sulphuretted hydrogen by contact with mineral sulphides filters into the lake below the surface and so affects the deeper water.

Snowfall in Finland.—The Finnish Geographical Society has organised a system of observations on the thickness of snow in Finland. Observations, made once a week with the aid of a fixed vertical rule placed in a sheltered place, have been sent in from one hundred and sixty-five stations, and the results are now embodied in a paper by A. F. Sundell in *Fennia* (1892, No. 7), as well as in a coloured map which represents the distribution of snow on March 28th, 1891, by means of curves of equal thickness traced at each 10 centimetres ($2\frac{1}{2}$ inches). Such charts have been constructed for every week, and the weekly observations have been controlled by the daily observations made at Helsingfors. The weekly observations do not represent the total thickness of fallen snow, which would be obtained if it were measured every day. Thus, the total, deduced from daily observations added together, gives for Helsingfors 43 inches, while the weekly observations only give $29\frac{1}{2}$ inches of snow. The relation between these two figures gives, however, a provisional correction which will ultimately be deduced with more accuracy, from observations which will be made in other parts of Finland as well. The total amount of snow for each separate region is given in a third chapter, and a minute calculation gives for all Finland an average thickness of 24 inches of snow. Each inch of snow (taking into account the just mentioned correction) would correspond to 0.18 inch of water, and this would mean that the total amount of water which is kept in the form of snow over the whole country would represent a layer of $4\frac{1}{2}$ inches of water. The thickest deposit of snow occurred in the extreme south-east, from Lake Saima to St. Petersburg, and in an isolated track running northward along the centre of Finland and just touching the head of the Gulf of Bothnia. For the rest there was a marked thinning of the snow-covering along the coast strip and towards the frontier with Northern Russia.

Glacial Formations in East Finland.—J. E. Rosberg has a paper on the Superficial Deposits in Russian and Finnish Karelia, with especial regard to the Karelian Lateral Moraines, in *Fennia* (1892, No. 7), which is an elaborate contribution to our knowledge of the subject. It also contains valuable materials for the study of the äsar and their relations to moraine deposits, and gives a good deal of information relative to the hydrography and geographical features of the region specially described. It is followed by a summary in German, and is illustrated by two valuable maps.

The Baltic Lakes.—At the tenth meeting of German geographers (Stuttgart, April 1893) Dr. W. Ule, of Halle, read a paper on the temperatures of the Baltic lakes. His investigations have shown that the Baltic lakes differ greatly from the Alpine lakes in the matter of temperature, as in great depths the former are comparatively warm, a fact which is in all probability due to the considerable amount of the underground water-supply. Also the formation of the shores has some influence, inasmuch as lakes with steep shores have lower temperatures. The direct influence of the sun, however, is comparatively of little importance, as is proved by the small daily range of the surface water. (Compare also *Geographical Journal*, 1893, pp. 61-62.)

ASIA.

The Trans-Siberian Railway.—A special Committee, under the Heir-Apparent of Russia, was appointed on March 8th for the supervision of the Siberian railway. At its second meeting the Committee decided that, after having crossed the Ob at the Krivoschekove village, the line will be continued to the town of Mariinsk, and thence to Achinsk, Krasnoyarsk, Kansk, Nizhne Udinsk and Irkutsk. It will thus follow in East Siberia the direction of the present highway which takes the direction indicated by the nature of the country.

Exploration in Siberia.—At the meeting of the Russian Geographical Society on March 22nd, the report of the Government mining expedition was read. The expedition was sent to explore the parts of Akmolinsk and Yeniseisk, which will be crossed by the Siberian railway. It reports that the eastern part of the Oshim Steppe, which is known as the Gorkaya, or Bitter Steppe, and which will be crossed by the railway between Petropavlovsk and Omsk, contains great numbers of salt and bitter lakes, but is almost entirely devoid of fresh water. Geological explorations having been made to ascertain the structure of the Steppe, the expedition came to the conclusion that there will be no difficulty in obtaining water, either by means of common wells or from artesian wells. The forests in the south of the Yeniseisk Government are immense, but the expedition recommends measures for protecting them from destruction—the more so as they will be required in the near future for the mining industry.

Exploration in Korea.—The Rev. L. O. Warner contributes to the April Number of *The Mission Field* an interesting account of a river journey he made in Korea during the months of September and October of last year. A start was made on September 1st from a small village on the banks of the Han called Hangkang, situated about 5 miles to the south-east of Seoul. For 100 miles or so above Seoul, the villages on the river banks are reported to be exceedingly numerous. After the first 100 miles the river becomes very shallow, and, owing to the many rapids, almost

impracticable for junk traffic. Between the village of Hangkang and that of Ma-chai (where a large tributary from the north joins the main stream, which flows southwards) a distance of 30 miles, there are at least thirty villages of various sizes, the most important and largest being Tonksyem, the inhabitants of which are mainly engaged in the timber trade. Between Ma-chai and the prefectorial town of Tanyang, a distance of something over 100 miles, there are one hundred and thirty-nine villages including four prefectorial towns, which are situated on the river banks, varying in size from hamlets of three or four houses to a town of three thousand seven hundred, which is the size of Nye-Ju, in the Kyeng-Keni-To Province. Again, between the town of Tanyang, in Chung-Ching-To, and that of Yeng-Choun, in the same province, a distance of about 25 miles, there are only ten riverside villages, this falling off in the numbers being apparently due to the fact that the river is too shallow to admit of much junk traffic. On the banks of the northern arm, which joins the main stream at Ma-Chai, and was ascended as far as the town of Nang Chyen, in the Province of Kang-Wen-To, a distance of slightly under 100 miles, there were found to be eighty villages, including two small prefectorial towns, namely, Ka-Hpyeng, in Kyeng-Keni-To, and Nang-chyen, in Kang-wen-To. Respecting the connection between the town of Tanyang, on the southern stream, in the province of Chung-Ching-To and the River Nak-Tong, Mr. Warner reports that, leaving the river at Tanyang, about 25 miles north of Yeng-Choun, the most southern point reached, he and his party travelled across the mountains into Kyeng-san-To, and made a journey of 60 miles to the town of An-Tong (following most of the way one of the small streams which eventually help to form the Nang-Tong-River). At An-Tong the river is not navigable, but appears to be so at a distance of about 45 miles to the south-west of the latter place. In order, therefore, to connect the two rivers it is necessary to travel slightly over 100 miles overland. The country people who inhabit these river-side villages appear to be mainly engaged in agricultural pursuits. There are to be found, besides, in several of the villages, manufacturers of pottery, china, and large earthenware jars; in others, there are settlements of charcoal-burners; while timber merchants, wood-cutters, and boatmen are frequently met with. At a few of the villages the people manufacture silk in small quantities; while in the district of Nang-Chyen, there appears to be a large industry in the manufacture of wooden bowls. Mr. Warner speaks very favourably of the attitude of the people towards foreigners, and concludes that the River Han may form a very important part of future missionary work in the country.

AFRICA.

The Wakua Steppe, German East Africa.—H. F. v. Behr describes in *Mittheilungen aus den Deutschen Schutzgebieten* (vol. vi. No. 1) a journey made by him in 1891 across the Wakua Steppe, an extensive tract of country between the Rovuma and Rufiji basins. The old caravan route from Kilwa to Lake Nyasa, followed by Roscher on his ill-fated journey in 1859, passed through this country, into which Von der Decken also penetrated some distance, but which has not been since explored. Von Behr's journey was undertaken in order to throw light on the course of the river Umbe-kuru, mentioned by those travellers, as well as to investigate the field for the supply of copal in these parts. Ascending to the Mpatila Plateau from Lindi he first proceeded to the Universities Mission Station Masasi which has never recovered its prosperity since the Magwangwara raid of 1881. From Mount Ntandi, on the slope of which the station is placed, a view was obtained over the wide steppes to the west, with isolated gneiss rocks scattered over their surface. The chief Mashemba, first visited by Livingstone on his last journey,

who for many years was the most active slave-trader in these parts, is still much feared by the natives; but since the restrictions put upon the trade he has had to turn his attention to the collection of indiarubber. The dense thickets with which his village is surrounded enabled him for some time to defy the German authorities, but he has since made his submission. From Masasi Von Behr set out for the Steppe with twenty porters and two Wakua guides. The latter soon deserted, taking with them a large supply of meat, which the leader's wife had supplied the day before, and difficulties now began. A village was luckily met with, and new guides obtained, only, however, to succumb to the same temptation as the former ones. Whilst with the party they had shown a wonderful instinct in guiding it across the trackless Steppe, without landmark, to a solitary water hole. Water at this time of year is only found at long intervals, and the stunted trees being for the most part completely bare the Steppe has a desolate appearance. Trusting at all events to come upon the course of the Umbe-kuru, the party pushed on. Only after leaving a dry river-bed far behind them, and finding no trace of water or of the old caravan route, did the conviction force itself upon them that that dry channel represented the river they were in search of. They were now in an almost desperate situation, with a three days' waterless tract behind them, having already begun to suffer severely from thirst. Retracing their steps they struggled on by night as well as day, the leader finding himself finally quite alone. When almost at the last extremity he was providentially guided to a pool of water by fresh tracks of game, and being joined by his servant made his way back to Masasi, whither all the party but two subsequently arrived in safety.

British Bechuanaland.—The last reports on British Bechuanaland (*Colonial Reports, Annual, No. 47*) show the progress made in the development of the country during the eighteen months ended March 31st, 1892. After the extension of the railway to Vryburg, a large quantity of merchandise for the South African Republic passed through the Colony, but much of this traffic has since been diverted by the opening of the Cape railways through the Orange Free State. Exports too, as far as statistics are available, show a marked increase. A large proportion, it is true, occurs under the head of timber and firewood, involving a deplorable destruction of forest, which cannot be reduced by imposing a duty owing to the free-trade agreement between the different countries of the Customs Union in respect of their own products. A more satisfactory, and still larger increase, is that of grain and cereals exported, mostly from the Bechuanaland Native Reserves, the prosperous condition of which proves the soundness of the policy which created them. Other exports are wool, and mohair (chiefly from the South African Republic), and skins, hides, horns, and ivory from Bechuanaland and the Protectorate. Good progress has been made with the trigonometrical survey, and a comparison with the best geodetic surveys of the world shows the high place it holds among them as regards accuracy. The Surveyor-General reports on the newly-annexed territory of Mier, adjoining the Anglo-German boundary, in which many grants of farms have been made, and much land available for sale still remains. The boundary cuts through David Vilander's country, leaving a portion outside British territory, much to the regret of that chief and his people. There is great scarcity of water, and the sinking of wells has not always proved so successful as has been the case also in Bechuanaland. Since June 1891, a beginning has been made in the collection of Revenue.

Notes on Tripoli.—From a recent Consular Report (*Annual Series, No. 1159, 1893*) on the trade of Bengazi, in the province of Tripoli, we learn that during 1891 the

exportation of cattle was unusually large, owing to the comparatively slight quantity of rain which fell during the winter months, and the consequent absence of pasturage. It is computed that not less than 19,000 cattle, or more than twice the number exported in 1890, were sent to Malta, Canea, and Alexandria, while about 400 horses and over 8000 sheep were sent to the same ports by sea, a still greater quantity of sheep going to Egypt by land. The report also states that a considerable trade is carried on with Wadai and other countries of the Central Sudan by means of caravans, which bring to the port of Bengazi large quantities of ivory and ostrich feathers, taking in exchange chiefly British cotton goods. This traffic, however, towards the close of 1891 began to be endangered owing to the attacks of tribes in revolt. The caravan route from Derna to Egypt is also unsafe from a similar cause. During the last five years the yield of salt at Bengazi has gradually increased, although during the same period there has been a considerable decrease in the amount sold. There has also been an increase during 1891 in the number of sailing vessels and boats employed in the sponge fishery, more especially in the case of those hailing from the Greek Islands. In its present isolated condition, owing to the want of a telegraph, there appears to be no hope of any regular development of trade at Bengazi.

Beira, South-East Africa.—Some interesting particulars regarding the present condition and future prospects of the Portuguese port of Beira in South-Eastern Africa are given in a recent Consular Report (Annual Series, 1893, No. 1163). The town of Beira, which dates its existence only from the beginning of the year 1891, is situated at the mouth of the Pungwe, and is the headquarters of the territory administered by the Mozambique Company. When the Pungwe River was first adopted as the best route into Mashonaland, a few stores were started here, and since then the town has rapidly developed. No regular census has yet been taken, but the population is assumed to be from 700 to 800, 200 being Europeans. A railway that is to bridge the "fly country" is now in course of construction from Beira, and on its completion will enormously increase the trade with the interior, forming, as it will, the highway into the British possessions of Mashonaland. The country around Beira is said to be full of game. There is a good safe harbour, and the climate, although hot, is equable. The name Beira signifies "bar," and has reference to the low sand ridge on which the town is situated.

AMERICA.

Exploration in Canada.—The work of the Geological Survey of Canada during the coming summer is to include two explorations possessing more than the usual amount of geographical interest, being directed to some of the extensive regions of the northern part of the Dominion which still remain practically unknown, and for which the indications appearing on the maps are little more than conjecture. Mr. J. B. Tyrrell, F.G.S., is to examine and report upon the country between Lake Athabasca and the western shore of Hudson Bay, the objective point on the bay being in the vicinity of Chesterfield Inlet. The greater part of the route proposed will traverse the "Barren Grounds," and it is hoped that it may be possible definitely to fix the main geographical outlines of that region, which are at present known only in the most imperfect way from sketches made by Samuel Hearne more than a hundred years ago. The second of the explorations is to

be carried out by Mr. A. P. Low, who, after reaching Lake Mistassini (the vicinity of which he has already examined), will follow the Eastmain River to its head, cross the watershed to one of the large rivers which are known to flow northward in the interior of the Labrador Peninsula, and descend this to Ungava Bay, on Hudson Strait. It is probable that Mr. Low will winter at Ungava, and return in 1894 to Hamilton Inlet by a different route. In explorations like these, geographical and geological work necessarily go hand in hand, and it is to be anticipated that their result will be to enable considerable additions to be made to the general geological map of Canada.

The Alaskan Boundary Survey.—The Alaskan Boundary is one of the many disputed questions which are the natural corollary of our widely-extended empire. The dispute in question is between the United States and Canada, and bearing the well-known and somewhat similar San Juan controversy in mind, it may be hoped that it will be quickly and amicably settled. For the purposes of final delimitation, the United States and Great Britain have now agreed, since the exchange of ratifications at Washington in August 1892, that "a coincident or joint survey (as may in practice be found most convenient) shall be made of the territory adjacent to that part of the boundary line of the Dominion of Canada and the United States of America, dividing the Province of British Columbia and the North-West Territories of Canada from the Territory of Alaska, from the latitude of $54^{\circ} 40'$ N. to the point where the said boundary-line encounters the 141° of longitude westward from the meridian of Greenwich by Commissions to be appointed severally by the High Contracting parties with a view to the ascertainment of the facts and data necessary to the permanent delimitation of the said boundary line in accordance with the spirit and intent of the existing treaties in regard to it between Great Britain and Russia, and between the United States and Russia." On this survey the Government of Canada will be represented. Alaska, with its estimated area of 580,000 square miles and broken coastline, was the hunting-ground of the Imperial Russian Fur Trading Company from 1799 to 1867. In that year the Territory, with all frontier difficulties attaching to it, was bought from Russia by the United States for 7,200,000 dollars. The whole boundary-line naturally falls into two sections, one of which begins from the southernmost extremity of Prince of Wales Island, ascends the Portland Channel, and, passing along the range of mountains, meets with the 141° of longitude west of Greenwich, and it is with this section that the present joint commission is concerned. The other section is the 141^{st} meridian itself, which is followed until the Arctic Sea, or, as it is termed in the treaty, "The Frozen Ocean," is reached. Here at Demarcation Point, not far from the mouth of the Mackenzie River, is the northernmost limit between Alaska and the North-West Territories of Canada. There is not much dispute about this latter section, the line being capable of astronomical definition, and in 1869 Captain Raymond of the United States Engineers, whilst engaged on a survey of the Yukon, was able to determine accurately the position of the old Fort Yukon, a trading port of the Hudson Bay Company. He proved that the old station was really in Alaskan territory, so the fur-traders retired up the Porcupine River to a point about which there was no doubt. In the spring of 1889 two parties were organised from the United States to ascend the River Yukon and its branch, the Porcupine, from Bering Sea with the object of establishing camps along the line of the 141^{st} meridian in order to make astronomical observations, one party under Mr. J. E. McGrath, taking the boundary south of Fort Yukon, and the second party under Mr. J. Henry Turner, taking the boundary

north of Fort Yukon to the Frozen Ocean. The results of their observations are embodied in the February number of the *National Geographic Magazine*. This, of course, was not a joint commission, but simply an expedition conducted by the United States Coast and Geodetic Survey. It is clear that the task of the present joint commission in settling the boundary-line on the south-east corner of Alaska amongst the island groups is more difficult. This in 1791 was the scene of the surveys by Captain George Vancouver, who searched the numerous islands and sounds for the long-desired water communication between the North Pacific and Hudson Bay, proving once for all that a "north-west passage" did not exist there. Subsequent boundaries and geographical definitions have been largely founded on his inferences. Dr. T. C. Mendenhall stated that the treaty defines the line as beginning at the southernmost extremity of Prince of Wales Island, which point *was supposed to lie* (the italics are ours, and the supposition Dr. Mendenhall's) on the parallel of $54^{\circ} 40'$ N. latitude, thence it shall ascend the Portland Canal (?) until the 50th parallel of north latitude is reached. From this point it shall follow the line marked by the summits of the range of mountains parallel to the coast until such line meets with the 141st meridian. In a supplementary note it was agreed that Prince of Wales Island should belong to Russia, and so now to the United States. It was also agreed that whenever the summit of the range of mountains referred to shall be at a greater distance from the coast than ten marine leagues, the limit of Alaska will be found by a line parallel to the windings of the coast, and never more than ten marine leagues from the shore. Dr. Mendenhall doubts the existence of this range of mountains, and so it will be necessary to fall back upon the second definition of the boundary line. To settle this as well as to determine the exact position of Prince of Wales Island will be, apparently, the chief task of the joint commission.

The Proposed New Capital of Brazil.—Last year the Brazilian Government sent an expedition into the interior for the purpose of fixing on a suitable site for the new national capital. Ernst Ule, naturalist of the National Museum at Rio de Janeiro, gives some account of the journey in the April number of *Petermann's Mitteilungen*. The Government set apart the sum of £20,000 for the expedition. Besides the eighteen members of the Commission, comprising doctors, meteorologists, geologists, astronomers and engineers, there were soldiers as escort and servants, which brought the number up to forty, with over one hundred and eighty horses and mules. The region explored lies to the north-west of Rio de Janeiro. It forms part of the Brazilian highlands, averaging 2000 feet in height. It is a rolling country covered with stunted trees and grass. Only in the river valleys is there a more abundant forest growth. The population is extremely sparse and the inhabitants are poor and lazy. Whether the expedition will fulfil its object of finding a suitable site, and if so, whether the new national capital will be a success is extremely doubtful. The scientific results of the expedition however seem likely to prove of some value.

Roads in Ecuador.—Mr. Haggard's recent Report on Ecuador (Foreign Office, Annual Series, 1893, No. 1146) attributes the backward condition of the country, mainly owing to the want of proper means of communication. At the present time the so-called roads are nothing but mule-tracks, which are

practically closed during the rainy season, which lasts for a great part of the year. In many places the only available tracks are the beds of the deep torrents formed in the loose volcanic soil, while in others a way has to be forced through miles of deep mud produced by the same cause. During the winter months it appears to be almost impossible for travellers, and quite so for merchandise, to pass even over the main track from Guayaquil to Quito, though in some places efforts have been made to make a real road of this. It will thus be seen that the interior of Ecuador is entirely shut out from commerce during about half of the year, and the resources of the country remain therefore almost wholly undeveloped. Ecuador is said to be one of the richest countries of the world. In the uplands the products of temperate climates flourish luxuriantly even under the present primitive system of agriculture. Near Quito, and in many another upland valley there is magnificent pasturage for cattle, while barley, wheat, maize, etc., grow luxuriantly; in a valley within only three hours' ride, tobacco, the sugar-cane, oranges, etc., flourish equally. Ecuador appears to be also rich in metals of all kinds. Mr. Haggard is of opinion that when a line is under serious consideration it will be found advisable to construct it to the interior, taking Bahia or Pailon, a place on the Colombian frontier, as a starting-point, rather than Guayaquil.

AUSTRALASIA AND PACIFIC ISLANDS.

Death of a New Zealand Explorer.—Intelligence has reached us of the death by drowning of Quentin Mackinnon, a well-known explorer and guide of the region surrounding Lake Te Anau in Western Otago. He discovered a pass now called by his name, by which tourists may pass from Milford Sound on the west coast to the picturesque lake region of the south-eastern slope of the Southern Alps. On this route a fine waterfall on the Clinton River was discovered by and named after Mackinnon.

Exploration in Central Australia.*—Although the important expedition, equipped by the liberality of Sir Thomas Elder, for the purpose of completing the exploration of the interior of Australia, has been unable to accomplish all that was expected of it, yet a glance at this map, which has been produced at the Surveyor-General's Office, Adelaide, will show that our knowledge of the geography of this portion of Australia has been considerably increased by the careful work done by the commander of the expedition, Mr. David Lindsay, and his assistants Messrs. Wells and Streichs. The new work, shown on the map, in the Colony of South Australia, is included between the latitudes 27° S. and 28° 20' S., commencing on the east at the Everard Range, and crossing the western boundary of the colony at the Blyth Hills. The country within these limits appears to have been very thoroughly explored, the track showing that it was traversed in all directions. In Western Australia, Mr. Lindsay first proceeded from Blyth Hills in a north-westerly direction to a point about 20 miles

* Map showing the explorations and discoveries in South Australia and Western Australia, made by the Elder Scientific Exploring Expedition, commanded by David Lindsay, F.R.G.S., etc., 1891-2.

north of Mount Squires, and from thence proceeded in a direct line for Victoria Springs. From this point the track on the map shows that he travelled nearly due south as far as the Fraser Range, and then in a north-westerly direction until he reached Mount Monger in the neighbourhood of Lake Lefroy, and it is at this point that the explorations for the year 1891 came to an end. The explorations of Mr. Lindsay and his party in the Eastern Division of West Australia in 1892, are shown on the western sheet of this map. On this occasion he started from a position about sixty miles south-west of the Kimberley Range, and, travelling towards the west, reached a point in latitude $27^{\circ} 55' S.$, longitude $124^{\circ} E.$; here he turned northwards, returning to the place from which he set out by a route about 60 miles to the north of that followed by him on his outward journey. The map is unusually complete in detail, and is covered with notes on the geology, physical geography, and nature of the country. The physiographical notes have been taken from the geologist's (Mr. Streich's) diary, except for the country between longitudes 119° and 125° , latitudes 26° and 28° , which are by Professor Tate from specimens collected by Mr. Wells. All camping places, trigonometrical stations, and water-holes, are indicated by symbols, and the routes of previous explorers are also laid down.

Triangulation of North-West Portion of South Australia.—The South Australian Government has recently issued Reports by Mr. J. Carruthers of his triangulation of portions of the north-west of South Australia. A summary has already been given of the first Report, which treats of the country triangulated in Everard, Musgrave, Mann, and Tomkinson Ranges, and Deering Hills, during the years 1888, 1889, and 1890.* The second Report deals with the country triangulated south of the Everard and Musgrave Ranges during 1891–92, and embodies a short description of the journey and the character of the country passed over. On this occasion the first and only depôt was formed at Indulkana Springs; and from here the country was triangulated westward from the existing previous triangulation west of the overland telegraph line. This tract of country, comprising about 5000 square miles, took nearly eight months to complete. That portion immediately south-east of the Indulkana Springs is described as chiefly open, stony tablelands, intersected by numerous creeks and watercourses, the vegetation in the valleys being cotton and salt bush, and good grass and herbage, with acacia, wattle, and myall. The country south and south-west of Indulkana and west of the Everard Range is chiefly sandy flats and sandhills covered with mulga scrub, wiry, and tussocky grasses, parakelia, sage-bush, and patches of salt-bush and other herbage. The most important waters found were the Oolarinna wells (native). The work was afterwards extended towards the western boundary of the province, where, during a period of ten weeks, 6000 square miles of country were triangulated, and 990 miles traversed. The country representing the above area chiefly consists of sandhills and sandy flats, covered with mallee, mulga, quondong, sage-bush, spinifex, and various shrubs and bushes, with belts of *Casuarina* (desert oak), and scattered poplar, pine, bloodwood, cork, and currajong trees. Between latitude $26^{\circ} 40'$ and $27^{\circ} 30' S.$ high granite hills are scattered about, averaging from 100 feet to 900 feet above the

* *Vide Proceedings*, 1892, p. 181.

level of the surrounding country. The work was further completed as far as Mount Barry, during which 1000 square miles of country were added to that already completed. An examination was also made of the country west of Eeavinna and England's Hill to the margin of the tablelands westward. Since leaving Adelaide on July 10th, 1891, to the departure of the party from Appreectinna Wells, Sept. 15th, 1892, no rain is said to have fallen.

The Great Rains in Queensland.—Mr. Clement L. Wragge writes as follows with regard to the recent remarkable rainfall which preceded the Queensland floods (see p. 239):—I send a few particulars of the recent remarkable rainfall at Crohamhurst, situated on the western slope of Mt. Blanc, a peak on a spur of the D'Aguiar range, an offset from the Blackhall Ranges, South-Eastern Queensland. The whole of this district is watered by the Stanley River, a tributary of the Brisbane River, and hence the values given below were prominent factors in producing the terrible floods from which we have suffered. I may mention that the observer at Crohamhurst is Mr. Inigo Owen Jones, one of my specially trained assistants, and that implicit reliance can be placed on his figures. The following are the more phenomenal falls for the flood period at Crohamhurst:—for twenty-four hours ending 9 a.m. Feb. 1st, 10·775 in.; ditto, Feb. 2nd, 20·056 in.; ditto, Feb. 3rd, 35·714 in.; ditto, Feb. 4th, 10·760 in. The gauge is a standard of the "8-inch" pattern, standing 1 foot above the ground, at an altitude of about 1400 feet above mean sea-level. The approximate latitude and longitude of Crohamhurst are 26° 50' S., 152° 55' E. The gauge was emptied every three hours, night and day, on the occasion of the greatest fall. I think meteorologists will agree that for a twenty-four hours' fall we have beaten the world's record.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

New Researches on the North Sea.—The Swedish and Danish Governments have supplied funds to enable Professor Pettersson of Stockholm to continue his researches into the physical condition of the water in the Skagerrak, Kattegat, Western Baltic, and eastern part of the North Sea. The first set of observations was made on May 1st, and they will be repeated on August 1st and November 1st, 1893, and on February 1st and May 1st, 1894. It appears probable that the Fishery Board for Scotland, which has for several years carried out valuable systematic observations along the western margin of the North Sea, may co-operate with the Scandinavian observers by choosing the date for a cruise already being planned, so as to ensure observations between the north coast of Scotland and Shetland being made simultaneously with those under Professor Pettersson's charge.

Oceanographic Work by Russians in Eastern Asiatic Waters.—Admiral Makaroff, of the Russian Navy, has given in *Petermann's Mittheilungen* for April an account of the oceanographic work done by the corvette *Witja* under his command during a voyage round the world. The *Witja*, bound for the east-Asiatic station, left Cronstadt in September 1886, reached the Sandwich Islands by way of Cape Horn in March, and Yokohama in April 1887. The summer was spent in cruising about the Japanese seas and the Sea of Okhotsk, the winter in the China Sea and the vicinity of the Philippines. In August 1888, we find the *Witja* in Bering Sea, before starting

home by way of Hongkong, Singapore and Suez. Cronstadt was reached in May 1889. Not much scientific work could be done till the *Witja* reached her station, but once there, Admiral Makaroff set to work with most commendable energy, and the results of his work, which will shortly be published in full, will prove a valuable addition to our knowledge of eastern Asiatic waters. Makaroff's remarks on the currents of these seas are highly interesting. It would appear that the Central Pacific drift strikes the eastern shores of the Philippines and is split into two branches. Of these the smaller goes south-west and south, the larger, forming the Kuro Shiwo, goes north and north-east, surrounding Formosa with its warm salt-laden water. It does not touch the mainland, being separated therefrom (at any rate during the prevalence of the south-west monsoon) by a current of water with a much smaller proportion of salt than the Kuro Shiwo, and flowing south from the Formosa Strait. The Kuro Shiwo flows towards Korea and splits on its southern point, a small current losing itself in the Yellow Sea, while the great mass surrounds Japan. On the south coast its influence is felt as far as Yokohama, from which point it takes an easterly turn. The current of the Korea Strait follows the coasts of Japan and Sakhalin, finding outlets in the Straits of La Perouse and Sangar. In the Sea of Okhotsk, Makaroff found a current running north along the west coast of Kamchatka, then west, and lastly south along the east coast of Sakhalin. It would appear, then, that Schrenck's statements regarding this region are incorrect. Makaroff attempts to explain the existence of the Oya Shiwo, the cold stream of the Kuriles. He is of opinion that tidal movements stir up the shallow waters of the inland seas, and cause their warm water to mix with the cold water of greater depth. The Shantar Islands, in the south-west corner of the Sea of Okhotsk, have long been noted for the length of time during which drift ice is seen there. Admiral Makaroff supplements this by the statement that on August 3rd he saw large masses of drift ice near Staritzki, at the north end of Sakhalin, while small quantities were visible as late as August 24th.

Observations on Ocean Currents and Waves.—At the meeting of the Geographical Society of Berlin, on January 7th, Dr. Schott read a report upon the results of the scientific observations during a voyage which he made last year on board a large four-masted sailing vessel. It appears that south and east of the Cape of Good Hope, between 20° and 53° E., there is not merely a current drifting eastwards and advancing in the train of the boisterous west winds, but also a cold Polar current, coming from the south, which is predominant. That this is so, is evidenced by the abnormally low water temperatures, the low salinity, and the northerly set of the current, as well as by the numerous floating icebergs. The striking differences of temperature which occur in short distances are, as regards the western part, to be ascribed to the warm Agulhas current; further east and north of Kerguelen Island, to the Madagascar current, which is remarkable for the great extent of its waters rather than for the absolute height of its temperature; along these longitudes there is, therefore, an absence of icebergs. This Madagascar current bears the same relation to the Agulhas stream as the Antilles current does to the Gulf Stream. It would appear as if all *intensive* but restricted oceanic currents are accompanied by a second *weaker*, but far more extensive, current. The more recent investigations as to the Kuro-Shiwo point to a similar phenomenon there. As regards the latter current, all the maps appear to represent it, in its course between Formosa and Japan, too far to the east. It flows for its whole extent west of the Lu-Chu Islands. Its left margin towards Asia is very sharply defined against the cold stream that flows along the Chinese coast, while its eastern border, like that of the Gulf Stream, is indistinct, and in some places

unrecognisable in consequence of the effect of the Earth's rotation. In the southern hemisphere, in the case of the Agulhas current, the observations show that its left margin is, like the right edge of the Kuro-Shiwo, indistinctly defined. A moderate trade wind causes waves, the length of which, from crest to crest, is about from 38 to 44 feet, the period from $4\frac{1}{2}$ to 5 seconds, and the velocity 58 feet a second, or $16\frac{1}{2}$ miles an hour. Big storm-waves on the other hand move at the rate of 40 miles an hour, and attain a length of 220 feet. No matter what the force of the wind was, the velocity of the wind was found, by Dr. Schott, to be in every case considerably greater than that of the waves. The relation of the height of the waves to the velocity of the wind is subject to very important variations. The height of the waves increases with the strength of the wind, not in simple proportion but in a hyperbolic ratio. Storm-waves rise at a greater angle than ordinary waves; the proportion between the height of the wave and its length is, on a rough sea, as 1 to 18, on a moderate sea, as 1 to 33. The highest waves measured with an aneroid provided with a micrometer, attained an elevation of 32 feet. It may, therefore, be said that even in the most violent storms on the open sea, waves of more than 50 feet are very rarely met with. For ascertaining the salinity of the ocean the refractometer, constructed by Professor Abbe, of Jena, proved to be of inestimable value during rough weather, and Dr. Schott recommends this instrument in the highest terms to future marine expeditions. The results of observations with Assmann's "aspiration thermometer" show that the temperatures formerly obtained from ships' observations in tropical waters are fairly correct, in cases where the thermometer was properly fixed and the rapid circulation of the air taken into account; during a calm much too high temperatures have been observed. On the other hand, the more extensive use of Assmann's "aspiration thermometer" will have the result of reforming very considerably our notions as to the humidity of the air of the tropics. The relative humidity will probably turn out to be about 15 per cent. less than is usually supposed.

Jäderin's Apparatus for the Measurement of a Base-line.—The seventh number of *Fennia*, the Finland Geographical Society's Journal, contains an important paper in French, by A. Bonsdorff. The triangulation which was made in 1886 and 1887 both in Finland and in Esthonia necessitated the measurement of a new base-line in addition to that of Pulkovo, and the place for it was chosen to the west of Pulkovo between Moloskovitsy and Ozeritsy. It has a length of 32,225 feet (about 6 miles), and was measured by Jäderin's apparatus. The apparatus consists, as is known, of metallic cords of 82 or 164 feet (25 or 50 metres) each, the exact length of which and dilatation coefficients are ascertained with great accuracy by comparison with standards at different temperatures. The wires, which have soldered to each end a short piece of tube finely divided into millimetres, are attached by their ends to tripods, and are stretched by dynamometers with a force of 22 lbs. Six cords are used, each separate measurement being made with two of different metals (steel and brass) so as to counteract the effects of temperature. The apparatus is previously tested by measuring some known base (Pulkovo in this case), and the lengths of the cords are verified again (after the measurement has been completed to ascertain the possible changes due to time). The rapidity of work with Jäderin's apparatus is such that the Moloskovitsy base, although six miles long over broken country, where steel bars could not be used, was measured twice in the course of only seven days. The average speed was thus over 9000 feet per day, and on one day a length of 19,700 feet (nearly 4 miles) was measured, thus giving the highest record ever attained with any apparatus. The accuracy of the measurements may be seen from the following table, giving the differences between

each of the separate measurements made by the apparatus of Struve and that of Jäderin, and the average length deduced separately from each series—

STRUVE.		JÄDERIN.	
	millimetres.		millimetres.
1870 . . .	+ 0.5	July 29 . .	+ 6.2
" . . .	- 6.3	August 3 . .	- 1.4
1872 . . .	+ 3.4	" 14 . .	- 4.8
" . . .	- 4.5		
1876 . . .	+ 7.0		

The first column shows larger differences than the second, and M. Bonadorff thus concludes that the different measurements with Jäderin's cords agree better together than those obtained by the apparatus of Struve.

Berzelius on the Variations of Sea-level.—S. Günther has lately (*Ausland*, 1893, No. 9) called attention to a remarkable anticipation of modern theory in the province of geo-physics, on the part of the great Swedish chemist Berzelius. Having turned his attention to changes of sea-level on the Scandinavian coasts, he propounded his views in his annual report on the progress of Physical Science (1835). He found an explanation in the lessening of the Earth's diameter owing to cooling; which, he said, would cause an irregular falling in of the crust, some parts being raised and others sinking. This exactly agrees, so far as it goes, with the latest views of Suess on the subject. Little notice, and that unfavourable, was taken of the theory at the time, but the objection from the supposed shortening of the length of the day involved has been set aside by recent investigations.

GENERAL.

The Humboldt Medal **of Berlin Geographical Society.**—The Humboldt Gold Medal was instituted in 1878 as the highest award which the Berlin Geographical Society could confer on an eminent geographer. Until this year it was only once awarded, General Prjevalski being the recipient. The second award has just been made to Dr. John Murray as the senior surviving member of the scientific staff of the *Challenger* in her great circumnavigation. The medal was intended to do honour to the memory of Humboldt by the recognition of work done in the spirit of that great pioneer, especially the comprehensive discussion of material collected on exploring journeys and serving to advance the scientific knowledge of the Earth. In announcing the award Baron von Richthofen said that looking back at the great geographical achievements of the last decades, he could see nothing which so admirably embodied the spirit which this prize was intended to foster as the voyage of the *Challenger*. Now after twenty-one years the results of that great voyage had been discussed and published in a set of gigantic volumes, a storehouse of rich and varied knowledge, fruitful in results alike to the practical and theoretical sides of physical geography.

Colonel R. W. Stewart's "Panoram."—A photographic camera, which it seems probable will in the future play an important part in the mapping of unsurveyed countries, has been invented by Col. R. W. Stewart, R.E., and Mr. Tweedy of Plymouth. It has the advantage of being smaller than an ordinary camera of the same capacity, and is also lighter, all the fittings being made of aluminium. It is easy to manipulate, and not likely to get out of order. The instrument consists of a rectangular box, whose length from back to front is a little more than the focal length of the lens to be used; its height is somewhat greater than the width of the film (for an 8-inch spool the height would be just 9 inches), and the breadth is a fixed dimension of 5 inches for all sizes. This camera rests on a circular disc, forming the head of the tripod-stand; to the bottom of the box is screwed, in a central position, a tubular arbor fitting into a socket in the disc, and the camera revolves freely on the stand; the box opens down one of its vertical edges, so as to give access to the hinder part of the camera or roll-holder: in this roll-holder are fixed four vertical rollers. The first of these has the tissue supplied by the Eastman Company wound on it; the second and third rollers serve to keep the film in the focal plane, and the fourth, which is called the winder, is actuated by a clock motion, with fly escapement, placed in the front part of the camera, the fly being normally blocked by an arm actuated by a pneumatic ball and tube of the ordinary kind. When required for use the camera is set up on its stand and levelled, the clock is wound up, the slit aperture adjusted, and a suitable stop put in; the camera is then turned round till it points to the left hand of the view required, the pneumatic bulb is squeezed when the clock starts working, and the camera begins to rotate, and continues to do so until the right-hand corner of the view is reached; the bulb is then relaxed; the clock stops, and the camera ceases to revolve. This is but a very general description of this ingenious instrument, which if used at each end of a base will give the angles between all objects photographed. The speed of rotation of the camera itself, and the rollers on which the film is wound, being all actuated by one motor and connected with one another, the ratios of motion must remain the same, and as the rates of such motion can be regulated by altering the ratio of the diameters of the roller and its pulley, it follows that the true rate of motion can be found. In the larger form of camera the films are rather more than 5 feet long, when photographs of the whole circle are taken, in which case they are developed by being primed on to the periphery of a drum, mounted on a horizontal axis, the sensitive surface just dipping into a dish holding the developer, the drum is then rotated until development is complete.

Geography Teaching in Birmingham.—Geography has received a certain amount of attention at the ancient Universities and in some University Colleges on account of the action of the Royal Geographical

Society in urging the importance of the study and in paying a large proportion of the lecturers' salaries. It is extremely gratifying to find that for several years systematic courses of instruction in physical and political geography have been given by Professor C. Lapworth, F.R.S., at the Mason College, Birmingham, in connection with his Chair of Geology. The lectures are very well attended, more than eighty students being enrolled for the present summer course. The lectures are now arranged in two courses on the Principles of Geography, about sixty lectures being given in each. In the Calendar of the Mason College for the current year, Professor Lapworth says:—"These courses of lectures embrace (1) a summary of the chief facts known concerning the present *Surface Features*, and the grander *Natural phenomena* of the 'world we live in'—its lands, its waters, its climates, and its inhabitants; (2) a study of the *Agents of Change*, organic and inorganic, which have brought about the present form and characteristics of its visible surface, and the distribution and arrangement of its living creatures; (3) with a brief sketch of the *Past history* and changes of the Earth's surface, and (4) an investigation of the present relations of this surface to *Man and his works*, his industries, his commerce, his distribution and progress, in so far as they can be traced through the outlines of the political geography of the present day. In other words, the special aims of the lectures are:—first, to give the student a general knowledge of the present physical features, the climates and productions of the Earth; next, to show how all these probably came into being, and how they are in continual process of change and development, and finally to show how man himself is related to the phenomena of the Earth upon which he dwells, how he has peopled its surface, and how he has availed himself of its productions." The first or elementary course is on Physical Geography, divided into (1) the Earth of the present in its relations to astronomy and mathematics, and with regard to land, sea, air, and living creatures; (2), the Earth of the past, comprising an account of the agencies producing surface change, and the processes by which the continents have assumed their present form. The senior course on Political Geography deals with the relation of man to the Earth and then summarises the actual conditions of this relation in the various continents with fuller details concerning the geography of certain countries selected as being typical. Throughout the instruction the effort made is to impress principles and induce the student to apply these to details which he seeks for himself in maps and books.

A Chair of Geography at Tübingen.—At the tenth meeting of German geographers at Stuttgart, in April, it was suggested by Count Carl von Linden, Baron von Richthofen, Professor Kirchhoff, and other eminent German scientists, that a Chair of Geography should be established at the famous South-German University of Tübingen. In response

to this suggestion the King of Württemberg expressed himself entirely in accord with the opinions brought forward, and declared his willingness to take the necessary initiatory steps in the matter. Accordingly a motion was at once put to and accepted by the Landtag. This result is due to the gentlemen mentioned above, especially to Count Linden, who, for years past, has with indefatigable energy and with great success promoted the interests of geography in South Germany. Hence geography is now taught at nineteen of the twenty-one German universities, Rostock and Heidelberg being the only ones which are still without geographical instruction. The total number of teachers, including professors and privat-docenten of geography at German universities, is at present over forty.

The Maps of Apianus.—Professor H. Wagner examines carefully into the existence of the maps of the world ascribed to Peter Apianus in a memoir entitled ‘Die dritte Weltkarte Peter Apians v. s. 1530 und die Pseudo-Apiandsche Weltkarte von 1551’ (Nachrichten von der K. Ges. der Wiss. zu Göttingen, December 28th, 1892). The first of these maps (Tipus Orbis universalis) accompanies Cramer’s edition of ‘Solinus,’ which was published at Vienna in 1520, as also Vadian’s edition of ‘Pomponius Mela’ of 1522. The second (Mappa mundi) illustrated the ‘Declaratio et Usus Typi Cosmographici’ of 1522, and is lost. The third map (Universalien cogniti Orbis Tabula, 1530) is now in the British Museum, and Professor Wagner promises to publish a facsimile of it. It is on the equivalent cardiform projection of Stabius and Werner, and in every way superior to the map of 1520. No other maps of the world can be traced to Apianus. That which accompanies the Antwerp edition of the ‘Cosmographia’ (1544) is undoubtedly by Gemma Frisius, and has been reproduced in the Paris edition of the same work (1551).

OBITUARY.

John Bartholomew.—Mr. John Bartholomew was born in Edinburgh on December 25th, 1831, and at an early age he commenced to learn map-drawing and engraving under the superintendence of his father, who had established a geographical business. Making rapid progress in his work Mr. Bartholomew came to London to act as assistant to the eminent geographer, Dr. Petermann, by association with whom he acquired an enthusiasm for thorough and accurate work which he retained to the end. Returning to Edinburgh in 1856 Mr. Bartholomew carried on his father’s business, which rapidly increased on account of the care and attention bestowed on every detail of map production. Atlases arranged and produced by Mr. Bartholomew have been published by a great many publishing firms in the United Kingdom and in other countries. Mr. Bartholomew’s name is specially associated with a series of reduced ordnance maps of Scotland and England on the

scales of 4 miles and 2 miles to an inch. On this work he spent many laborious years, although aware that it was in some respects in advance of the requirements of the public, and some of his best geographical work must have resulted in financial loss. In 1889 Mr. Bartholomew retired from active work, leaving the management of his greatly-expanded business to his son, Mr. J. G. Bartholomew, who, following out his father's training, has succeeded to some extent in educating as well as supplying the public demand for maps.

Mr. Bartholomew became a Fellow of the Royal Geographical Society in 1857. He was retiring in disposition, but the genuine kindness of his character was felt and appreciated by all with whom he came in contact. The gradual failing of health which had been going on for some years necessitated a visit to London, where he died on March 20th, 1893.

William Cotton Oswell, who died on May 1st at Groombridge, near Tunbridge Wells, aged seventy-five years, went to India as a young man, but the climate proved a barrier to a successful career in the Madras Civil Service, and he was ordered to the Cape in broken health. It is more than half a century since Oswell landed in Capetown, and he was amongst the earliest English sportsmen to visit the plains of the interior, where his health was rapidly re-established. He spent the greater part of five years in South Africa, during which his adventures were of the most varied and thrilling kind, and in his later life he never wearied of telling the exploits of his companions and himself as they were recalled by the fine heads of big game which adorned his house.

When he was in Africa, vast herds of game of every kind roamed over tracts that are now the sites of busy towns, or occupied by sheep-farms, where antelopes are now rarer than lions were then. The Kalahari desert was looked upon as an impassable barrier against advance from Cape Colony northward. Livingstone was fortunate enough, in his early travels, to secure the companionship of Oswell, who looked after the waggons, kept the party in food, and enabled his friend to carry on his work of surveying, making scientific collections, and studying the native peoples in freedom from the minor troubles of a wandering life. In 1849, when Livingstone determined to investigate the truth of rumours as to a great lake in the Kalahari, Oswell and his friend Mungo Murray returned to South Africa from England, in order to take part in the exploration, of which indeed they bore the greater part of the expense. The result was the discovery of Lake Ngami, and the important practical demonstration that the Kalahari could be crossed by oxen and waggons. For his part in this journey Oswell received a silver medal from the Paris Geographical Society.

Mr. Oswell was a fine example of the best type of adventurous sportsmen. He was singularly handsome, lithe in figure, knightly in bearing, utterly fearless, and beloved by all the South African travellers of his day. He had a constitutional shrinking from publicity, and never even wrote for publication, although he spared neither time nor trouble in revising and elaborating the books written by his friends on subjects with which he had made himself familiar. He joined the Royal Geographical Society in 1852, and served on the Council in 1855, although he could rarely be induced to take part in the public meetings of the Society.

After leaving Africa, Mr. Oswell travelled extensively in South America and elsewhere. For many years he resided quietly at Groombridge, unknown to the general public, but the centre of a great circle of warm personal friends, to whom his unfailing geniality and delicate consideration endeared him in an exceptional degree. He is survived by a widow and family.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1892-93.

Eleventh Ordinary Meeting, April 24th, 1893.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., President, in the Chair.

ELECTIONS.—Colonel H. Cautley, R.E.; J. C. Clancey; Walter Clifford; Rev. J. J. B. Coles, M.A.; Lieut. Francis John Davies (Grenadier Guards); George Frederick Edwards; Robert Glennie; Commander Charles Harvey; Joseph Hinchliffe; Charles W. May; James R. Renton.

The Paper read was:—

"Journeys in French Indo-China." By Hon. G. N. Curzon, M.P.

There was an exhibition of photographs in the tea-room.

Twelfth Ordinary Meeting, May 8th, 1893.—The Right Hon. Sir MOUNTSTUART E. GRANT DUFF, G.C.S.I., F.R.S., President, in the Chair.

ELECTIONS:—Arthur Bird; Thomas Benjamin Bowring; Ellis Carr; Rev. C. C. Childs, M.A.; Rev. Charles Cook; William Alfred Eekersley; Arthur Greg, J.P.; Edmund W. Janson, B.A.; John Revilliod; Frederick Charles Smith; Walter J. Stanford; Robert M. W. Swan; Surgeon-Major L. A. Waddell (Bengal Medical Staff); Peter F. Wood.

The Paper read was:—

"Exploration and Climbing in the Karakoram Mountains." By W. M. Conway.

There was an exhibition of photographs and paintings in the tea-room.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

EUROPE.

Balkan States.

Le Capitaine de Pimodan. De Goritz à Sofia. Istrie, Dalmatie, Monténégro, Grèce, Turquie, Bulgarie. Paris, Champion, 1893: 8vo, pp. 212. Price 5 fr.

Pimodan.

A bright and pleasant diary of a four months' tour through the Balkan States.

Black Sea. *Bul. Acad. Imp. Sci. St. Petersburg* 35 (1893): 437-448. Andrussov. Sur l'état du bassin de la mer Noire pendant l'époque pliocène. Par N. Andrussov.

Black Sea.

Monographie des Turbellariés de la Mer Noire. Par Dr. Sophie Pereyaslawzewa. Odessa, A. Schultze, 1892: 8vo, pp. xx. and 303, plates.

Pereyaslawzewa.

Danube.**Voisin.**

Notice sur les Travaux d'amélioration de l'embouchure du Danube et du Bras de Soulina, 1857-1891. Par Voisin Bey. Paris, Dunod, 1893: 8vo, pp. 512. Plates. Presented by Sir Charles Hartley, K.C.M.G.

An account of the works carried out by the International Commission of the Danube for improving and maintaining the access for steamers to that river. The book, which is reprinted from the *Annales des Ponts et Chaussées* for January and February 1893, is based on the great official publications of the Commission, of which it forms a useful summary.

English Climatology.**Bayard.**

English Climatology 1881-1890. By Francis Campbell Bayard. [From the Quarterly Journal of the Royal Meteorological Society, Vol. xviii., No. 84, October, 1892.] 8vo, map. Presented by the Author.

Finland—Snowfall.

Fennia (1892): 7 No. 3, pp. 60.

Sundell.

Snöfläckets höjd i Finland, Januari-Maj 1891. Af A. F. Sundell.

On the snowfall of Finland in the winter of 1891, with a map and French summary.

Flanders.

Ann. Géog. 2 (1893): 306-314.

Gosselet.

La plaine maritime du Nord de la France et de la Belgique, avec carte. Par Gosselet, professeur de géologie, Lille.

France.**Desjardins.**

Géographie, historique et administrative, de la Gaule Romaine. Par Ernest Desjardins, de l'Institut. Tome Quatrième. Les Sources de la Topographie comparée; contenant 13 planches et 17 figures dans le texte, suivi d'une table alphabétique générale de tout l'ouvrage. Paris, Hachette et Cie., 1893: pp. iv. and 296. Price 20 fr.

The last volume of the late M. Desjardins' great work on Roman Gaul was little more than commenced at the author's death, and a large amount of material which he had collected remained undiscussed. The volume now issued is in part written by M. Longnon, who, with other friends and pupils, has revised the whole, and the complete index to the four volumes was compiled by Mme. Desjardins. The volume deals with the Roman roads of France, but from the circumstances mentioned above the description is incomplete. M. Longnon therefore hopes in an independent work on which he is now engaged to produce what will be really the final volume according to his master's original plan.

France—The Causses. *Bul. Soc. normande Géog.* 14 (1892): 266-288, 320-335. **Martel.**

Le sous-sol des Causses (Cavernes et rivières souterraines). Par M. E. A. Martel. Numerous illustrations.

French Lakes.

Compt. Rend. 118 (1893): 700-702.

Delebecque.

Sur les lacs des Sept-Laux (Isère) et de la Girotte (Savoie). Note de M. A. Delebecque.

Germany—Oder.**Leonhard.**

Der Stromlauf der mittleren Oder. Inaugural-Dissertation zur Erlangung der philosophischen Doctorwürde . . . Universität Breslau. April, 1893. 8vo, pp. 72. With maps. Presented by the Author.

An account of changes in the course of the River Oder, with maps of its position at different dates.

Italy.**Baedeker.**

Italy. Handbook for Travellers. By K. Baedeker. Second Part: Central Italy and Rome. Eleventh edition. Leipzig, Karl Baedeker, London, Dulau & Co., 1893: pp. lxxii. and 420, maps, plans, etc. Price 6 marks. Presented by Messrs. Dulau & Co.

Montenegro. *Rev. Française* 17 (1893) : 337-354. **Sobieski.**

Le Monténégro. Étude géographique et militaire. Par Sobieski.

A summary of the geography of Montenegro with an outline map.

Russia. *Bul. Soc. Roy. Géog. Anvers* 17 (1893) : 184-206. **Gourévitch.**

Les ressources matérielles et intellectuelles de la Russie. Par M. Gourévitch.

Amongst other changes in progress in modern Russia the displacement of the great industrial centres from north to south, and the growing importance of the Black Sea harbours, are referred to.

Scandinavia. *Ausland* 66 (1893) : 170-172, 186-188. **Haas.**

Vorweltliche Lateritbildung in Skandinavien und ihre Beziehungen zum Tertiär und Diluvium Norddeutschlands. Von H. J. Haas (Kiel).

Spain—Ternel. *Ann. Géog.* 2 (1893) : 315-328. **Dereims.**

Nouvelles Observations sur la Géographie physique du Plateau de Ternel, avec figures et une carte en couleur. Par A. Dereims, Paris.

The cretaceous plateau of Ternel, south of the Ebro, is one of the poorest and most barren parts of Spain, effects which the author traces to the character of the soil, the altitude, and the extreme severity of the climate.

Spain. *Verhandl. Ges. Erdkunde Berlin* 20 (1893) : 131-147. **Fischer.**

Herr Professor Theobald Fischer : Reiseakizzen aus Spanien und Portugal. With map.

An abstract of this paper appears at p. 347.

Sussex. *Handbook for Travellers in Sussex.* Fifth edition. London, John Murray, 1893 : post 8vo, pp. [22] and 173, maps and plan. Price. 6s.

Presented by Mr. Murray.

The numerous large-scale maps, by Bartholomew, form a special feature of this edition.

Switzerland—Maps. **Graf.**

Bibliographie Nationale Suisse. Cartes de Parcelles plus ou moins grandes du territoire Suisse. Publié par le Bureau Topographique Fédéral. Rédigé par le Prof. Dr. J. H. Graf. (Fascicule II b.) Berne, K. J. Wyss, 1892 : pp. 171-335.

Turkey—Chalkidike. *Mitt. Geog. Ges. Wien* 36 (1893) : 1-22. **Brüch.**

Des Aristoteles Heimat oder die Halbinsel Chalcidice. Von Josef Adolf Brüch.

ASIA.

Borneo—Sambas. *Bul. Soc. Géog. Lyon* 11 (1893) : 543-563. **Agassiz.**

Un Voyage à Bornéo, Sambas (Ouest Bornéo). Par M. F. Agassiz.

Ceylon—Census. **Lee.**

Census of Ceylon, 1891. . . . Compiled by Lionel Lee. 3 vols. Colombo, 1892 : folio, pp. (Vol. i.) vii. and 63, map ; (Vol. ii.) iv. and 547 ; (Vol. iii.) 95.

The population of Ceylon consisted on February 26th, 1891, of 3,007,789 persons.

- Cyprus.** *Zeitsch. Ges. Erdkunde Berlin* 27 (1892): 420-486. **Oberhummer.**
 Aus Cypern. Tagebuchblätter und Studien. Von Eugen Oberhummer.
 II. Teil.

- India.** **Deakin.**

Irrigated India. An Australian view of India and Ceylon, their Irrigation and Agriculture. By the Hon. Alfred Deakin, M.L.A. With a map. London, Thacker & Co., 1893: 8vo, pp. xii. and 322. *Presented by the Secretary of State for India.*

- India—Great Trigonometrical Survey.**

Synopsis of the Results of the Operations of the Great Trigonometrical Survey of India. Vol. xxvii. Descriptions and Co-ordinates of the Principal and Secondary Stations and other fixed points of the Madras Longitudinal Series or Series G of the Southern Trigon. Prepared in the Office of the Trigonometrical Branch, Survey of India, Colonel G. Strahan, R.E., Deputy Surveyor-General, in Charge. Published under the orders of Colonel H. R. Thuillier, R.E., Surveyor-General of India. Dehra Dun, 1892: 4to, pp. 149, *diagram and charts.*

— Vol. xxviii. The Madras Meridional and Coast Series or Series E of the Southern Trigon. Dehra Dun, 1892: 4to, pp. 185, *diagram and charts.*

— Vol. xxx. The Abu Meridional Series or Series I and the Gujarat Longitudinal Series or Series K of the South-West Quadrilateral. Dehra Dun, 1892: 4to, pp. 18, and 60, *diagram and charts.* *Presented by the Secretary of State for India.*

- India—Historical.**

Danvers.

Report to the Secretary of State for India in Council on the Portuguese Records relating to the East Indies contained in the Archivo da Torre do Tombo, and the Public Libraries at Lisbon and Evora. By F. C. Danvers. London, 1892: 8vo, pp. xii. and 210. *Presented by the Secretary of State for India.*

- India—Karnal District.**

Gazetteer of the Karnal District. Compiled and published under the authority of the Punjab Government. Lahore, 1892: pp. ix., 322, and xliii. *Presented by the Secretary of State for India.*

- Japan—Yezo.**

Smithsonian Report (1890): 417-502.

Hitchcock.

The Ancient Pit-dwellers of Yezo, Japan. . . . The Ainos of Yezo, Japan. By Romyne Hitchcock. *Many illustrations.*

- Northern Siberia.**

Cherski.

Wissenschaftliche Resultate der von der kaiserlichen Akademie der Wissenschaften zur Erforschung des Janalandes und der Neusibirischen Inseln in den Jahren 1885 und 1886 ausgesandten Expedition. Abtheilung IV. Beschreibung der Sammlung post-tertiärer Säugethiere. Von J. D. Tscherski. St. Petersburg, 1892: roy. 4to, pp. 512. *Plates.*

This paper forms No. 1 of Volume xl. of the *Memoirs* of the St. Petersburg Academy of Sciences.

- Palestine.**

Merrill.

The Jaffa and Jerusalem Railway. By Selah Merrill. Large 8vo, pp. 11, *illustrations.* From 'Scribner's Magazine,' March, 1893.

- Pamirs.**

Ansland 66 (1893): 193-197, 212-214, 230-234, 246-250.

Stern.

Pamir "das Dach der Welt." Von Bernhard Stern (Wien).

Replete with references to papers in all languages.

- Perak Handbook.**

The Perak Handbook and Civil Service List, 1893. With a new map. Taiping: large 8vo, pp. xxviii. and 301. *Presented by the Government Printer, Perak.*

- Philippine Islands.** *Journ. Soc. Arts* 41 (1893): 577-590. **MacPherson.**
The Philippine Islands. By H. A. MacPherson. With discussion.

Siberia.

Die wissenschaftliche Thätigkeit der Ost-Sibirischen Sektion der kaiserlichen russischen geographischen Gesellschaft im Jahre 1891: 8vo, pp. 40.

- Siberia—Orkhon.** *Bul. Acad. Imp. Sci. St. Petersburg* 35 (1893): 353-398. **Radloff.**
Dr. W. Radloff's Vorläufiger Bericht über die Resultate der mit Allerhöchster Genehmigung von der Kaiserl. Akademie der Wissenschaften ausgerüsteten Expedition zur archäologischen Erforschung des Orkhon-Beckens. Aus dem Russischen übersetzt von O. Haller.

- Sumatra Achin.** *Globus* 63 (1893): 281-288. **Schott.**

Ein Besuch in Atjeh auf Sumatra. Von Dr. Gerhard Schott, Berlin.
Illustrations.

General account of a short visit to Achin in 1892.

Tibet.**Bower.**

Diary of a Journey across Tibet. By Captain H. Bower, 17th B.C. Calcutta (not for sale), 1893: 8vo, pp. 116 and x., *maps and illustrations.*

The illustrations are reproduced admirably from photographs, and the diary records all the incidents of Captain Bower's well-known journey.

AFRICA.**Africa.****Waller.**

Health Hints for Central Africa, with remarks on "Fever," its Treatment and Precautions to be used in Dangerous Localities. By Rev. Horace Waller. Fifth edition. London, John Murray, 1893: 16mo, pp. 62. *Price 1s. Presented by the Author.*

- African Flora.** *Natural Science* 2 (1893):

Elliot.

Climate and Floral Regions in Africa. By G. F. Scott Elliot, M.A., B.Sc.

Cameroons.**Jaeger.**

Kamerun und Sudan. Ein Mahnwort an das deutsche Volk. Von H. Jaeger. Erster Teil. Berlin, Benge, 1892: 8vo, pp. 162. *Presented by the Publisher.*

The author, alarmed by French and British indifference to the claims of Germany to the hinterland of the Cameroons, has prepared this work as a reminder to his countrymen that they should develop the resources of West Africa.

Cape of Good Hope.**Campbell.**

Imperial Federation Series of Colonial State-Paper Catalogues. Edited by Frank Campbell (of the Library, British Museum). No. 1. Cape of Good Hope, 1892 (Preliminary Issue). London, 1893: 8vo, pp. 20. *Price 6d. Presented by the Editor.*

If well carried out on a uniform plan the scheme for an index of Colonial State Papers foreshadowed in this pamphlet should prove useful.

East Africa.**Davis.**

An American in Africa. By Richard Harding Davis. 8vo, pp. 3, *portrait.* From 'Harper's Magazine,' March, 1893.

A brief sketch of Mr. William Astor Chanler's Expedition in Africa.

East Africa.**Sheldon.**

Sultan to Sultan. Adventures among the Masai and other Tribes of East Africa. By M. French Sheldon, "Bébé Bwana." London, Saxon & Co., 1892: sm. 4to, pp. 435, *map, portrait, and illustrations.*

A narrative of experiences in the Kilimanjaro Region of East Africa.

- Egypt—Nile.** *Mitt. Geog. Ges. Wien* 36 (1893): 165-186. **Kupka.**
Nil-Gezeiten und Bewässerung. Von P. F. Kupka.

- Exploration.** **Veth.**
De Nederlanders in Afrika. Door P. J. Veth. Leiden, E. J. Brill, 1893:
8vo, pp. 56. *Presented by the Author.*
On the work of the Dutch in exploring Africa.

- Kilimanjaro.** **Le Roy.**
Missions Catholiques (1893): 10, 16, 29, 54, 64, 78, 90, 101, 113, 124, 137,
149, 161, 173, 187, 197, 209, *illustrations.*
Au Kilima-Ndjaru (Afrique Orientale). Par Mgr. Alexandre Le Roy.
Deuxième Partie. Du Kilima-Ndjaru au Zanzibar.

- Mashonaland.**
Mashonaland: 8vo, pp. 37. *From the 'Edinburgh Review,' April, 1893.*

- Sierra Leone.** **Sibthorpe.**
The Geography of Sierra Leone. Revised, corrected and enlarged. By
A. B. C. Sibthorpe, *alias* Aucanlu, Prince of Cucuruku, Niger, F.P.
Second edition. London, Elliot Stock: 16mo, pp. 24.
The Geography of the Surrounding Territories of Sierra Leone. Same
author and publisher. 16mo, pp. iv. and 46. *Presented by the Author.*

These little books are arranged in the form of question and answer, and intended
for use in schools. While much of the information is trustworthy and a good deal
of it fresh and interesting there are many statements which require to be qualified.

- Slave Trade.** **Stanley.**
Slavery and the Slave Trade in Africa. By Henry M. Stanley. 8vo,
pp. 19, *illustrations.* *From 'Harper's Magazine,' March, 1893.*

- Tuat.** **Globus** 63 (1893): 274-277. **Rohlf.**
Tuat, von Gerhard Rohlf.

- West Central Africa.** **Arnot.**
Bihé and Garenganze. Or Four Years' Further Work and Travel in
Central Africa. By Fred. S. Arnot. London, Hawkins & Co. [1893]:
8vo, pp. viii. and 150. *Price 2s. 6d. Presented by the Author.*

The record of a very remarkable journey from Benguela through Bihé to Garenganze (Katanga), returning by the Sankuru and Congo. The description is mainly
from the missionary point of view.

NORTH AMERICA.

- Alaska.** *National Geog. Mag.* 4 (1893): 177-197. **Mendenhall** and others.
The Alaskan Boundary Survey. I. Introductory. By Dr. T. C.
Mendenhall. II. The Boundary South of Fort Yukon. By J. E.
McGrath. III. The Boundary North of Fort Yukon. By J. Henry
Turner.

- Alaska—Weniaminof.** *Trans. Geog. Soc. Pacific* 3 (1892): 59-62. **Davidson.**
The Eruption of the Volcano Weniaminof Peninsula of Alaska. By
George Davidson. *With map.*

The eruption took place in August, 1892, and the volcano occurs in a region as yet
almost unexplored.

- America.** *Mitt. Geog. Ges. Wien* 36 (1893): 85-99. **Marilaun.**
Der Antheil Oesterreichs an der naturwissenschaftlichen Erforschung
Amerikas. Von A. Kerner von Marilaun.

- British Columbia.** *Journ. Roy. Colonial Inst.* 25 (1893): 327-352. **Dawson.**
The Mineral Wealth of British Columbia. By George M. Dawson,
C.M.G., LL.D.

Canada.

Nelson.

The North-West of Canada. By Joseph Nelson. Large 8vo, pp. 5. From the 'Westminster Review,' March, 1893.

Historical Geography. *Rev. Géog.* 32 (1893): 242-248.

Marcel.

La Colonisation française dans l'Amérique du Nord, d'après l'Exposition Cartographique de la Bibliothèque Nationale, organisée par M. Gabriel Marcel. A-propos de l'Exposition universelle de Chicago (1893).

Mexico.

American Journ. Sci. 45 (1893): 307-324.

Hill.

The Cretaceous Formations of Mexico and their Relations to North American Geographic Development. By Robert T. Hill.

A discussion of the geology of Mexico, with sketch maps and other diagrams.

United States.

Baedeker.

The United States with an Excursion into Mexico. Handbook for Travellers, edited by Karl Baedeker. With 17 maps and 22 plans. Leipzig, Karl Baedeker; London, Dulau & Co., 1893: 12mo. pp. c. and 516. Price 12s. Presented by Messrs. Dulau & Co.

Many excursionists in the United States this year will thank Mr. J. F. Muirhead for the admirable guide-book he has added to Baedeker's Series. The subject is perhaps the most difficult ever attempted, but the familiar minuteness of essential detail, clear arrangement and practical character were never more usefully brought together.

United States—Athabaskan Languages.

Pilling.

Bibliography of the Athapaskan Languages. By James Constantine Pilling. Washington, Government Printing Office, 1892: 8vo, pp. 126.

United States—California. *Verhandl. Ges. Erdkunde, Berlin* 20 (1893): 116-130.

Hilgard.

Herr Professor Dr. E. W. Hilgard: Skizze der physikalischen und industriellen Geographie Californiens. With map.

United States—Dakota Dictionary.

Riggs.

Department of the Interior, United States Geographical and Geological Survey of the Rocky Mountain Region, J. W. Powell in charge. Contributions to North American Ethnology. Vol. vii. A Dakota-English Dictionary. By Stephen Return Riggs, edited by James Owen Dorsey. Washington, 1890: 4to, pp. x. and 665. Presented by the Director of the Survey.

United States—Indian Ethnology.

Powell.

Seventh Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1885-86. By J. W. Powell, Director. Washington, 1891: 4to, pp. xli. and 409, maps and plates. Presented by the Director of the Bureau of Ethnology.

United States—Mount Whitney. *Sierra Club Bulletin* 1 (1893): 1-8.

Dyer.

The Mount Whitney Trail. By Hubert Dyer.

The first number of the *Bulletin of the Sierra Club* of San Francisco contains several other short articles on local geography and mountaineering.

United States—Tacoma.

Wickersham.

Is it "Mount Tacoma" or "Rainier"? What do History and Tradition say? By Hon. James Wickersham. From the *Proceedings of the Tacoma Academy of Science*, 1893: 12mo, pp. 16. Presented by the Author.

Vinland.

Bull. American Geog. Soc. 24 (1892): 510-535.

Smith.

The Vinland Voyages. By Professor Charles Sprague Smith.

Professor Smith reviews the evidence for the historical accuracy of the Sagas, and concludes, "We therefore affirm unhesitatingly that, about the year 1000, some portions of the Eastern American coast were discovered by Norsemen, and an attempt was made to colonise them." He does not enter into any discussion as to the landfall, or the modern names of Markland, Vinland, and Helluland.

CENTRAL AND SOUTH AMERICA.

Paraguay.

Bruyssel.

La République du Paraguay. Par Ernest Van Bruyssel. Bruxelles, Librairie Européenne, C. Muquardt, 1893: 8vo, pp. 220. Price 6 francs.

A compilation from various sources brought together to form a picture of the history and present state of Paraguay similar to the author's previous works on Mexico, Uruguay, and the Argentine Republic.

Patagonia.

Hudson.

Idle Days in Patagonia. By W. H. Hudson, C.M.Z.S. Illustrated by Alfred Hartley and J. Smit. London, Chapman & Hall, 1893: 8vo, pp. viii. and 256. Price 14s.

A charming narrative of wanderings in the extreme south of the Argentine Republic showing the same sympathetic insight into plant and animal life which characterise the author's earlier book on the Argentine Republic.

Patagonia.

Pet. Mitt. 40 (1893): 49-62.

Siemiradzki.

Eine Forschungsreise in Patagonien von Dr. Josef v. Siemiradzki.

West Indies—Tobago.

Geog. Blätt. 16 (1892): 1-20.

Eggers.

Die Insel Tobago von Baron H. Eggers.

The paper is accompanied by a vegetation-map of the island.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia.

Saville-Kent.

The Great Barrier Reef of Australia, its Products and Potentialities. By W. Saville-Kent, F.L.S., etc. Containing an account, with copious coloured and photographic illustrations (the latter here produced for the first time), of the corals and coral reefs, pearl and pearl-shell, bêche-de-mer, other fishing industries, and the marine fauna of the Australian Great Barrier region. London, W. H. Allen & Co. [1893]: 4to, pp. xxiii. and 387, map. Price 24s.

This work will be specially reviewed.

Australia.

Journ. Roy. Colonial Inst. 24 (1893): 225-262.

Wallace.

Australasian Agriculture. By Professor Robert Wallace.

Australia—Vegetation.

Jour. and Proc. Roy. Soc. N.S.W.

Hamilton.

26 (1892): 178-239.

On the Effect which Settlement in Australia has produced upon Indigenous Vegetation. By Alex. G. Hamilton.

British New Guinea.

Annual Report on British New Guinea from July 1st, 1891, to June 30th, 1892, with appendices. Brisbane, J. C. Beal, 1893: folio, pp. xxxii. and 113, maps.

This Report, as usual, mainly consists of a collection of despatches from Sir William Macgregor, describing visits to various parts of the Possession, most of which have already been noticed in these pages.

New Guinea.

Journ. Roy. Colonial Inst. 24 (1893): 419-444.

Richards.

British New Guinea. By T. H. Hatton Richards.

New Hebrides.

Trans. Roy. Geog. Soc. Austral. (Victoria Branch)

Lindt.

10 (1893): 32-40.

The Resources and Capabilities of the New Hebrides. A Pioneer Coffee Plantation. By J. W. Lindt, F.R.G.S.

New Hebrides—Santo.

Trans. Roy. Geog. Soc. Austral. (Victoria Branch) 10 (1893): 43-57.

Macdonald.

West Coast of Santo—Traditions, Superstitions, Customs, etc. By the Rev. A. H. Macdonald.

New South Wales.

Annual Statement of Works carried out by Public Works Department during the year 1891. Sydney Charles Potter: fo, pp. 192. *Illustrations, Price 7s. 6d. Presented by the Agent-General for New South Wales.*

The descriptions of railway extension, harbour and water-works, and sewerage, are illustrated by a series of fine photographic reproductions, showing the manner in which the natural conditions of the surface have been dealt with by the Colonial engineers.

New Zealand—Tongariro. *Trans. Roy. Geog. Soc. Austral. (Victoria Branch)* 10 (1893): 15-25.

Cussen.

Notes on the Tongariro-Ruapehu Volcanic Mountains, New Zealand. By Laurence Cussen, Esq.

Illustrated notes with rough sketch-maps from the Government surveys.

Queensland—Census.

Eighth Census of the Colony of Queensland, taken on April 5, 1891. Brisbane, J. C. Beal, 1892: folio, pp. lxxxiv., 469 and xci., *map and diagram.*

The total population of the Colony, exclusive of aborigines, enumerated on April 5th, 1891, was 393,718 persons—223,779 males and 169,939 females.

Samoa.

Weissbuch. Vorgelegt dem Reichstage in der 2 Session der 8 Legislatur-Periode, Dreizehnter Theil. Samoa iv. Berlin, Carl Heymanns Verlag, 1893: 4to, pp. 218.

Official correspondence regarding Samoa from April 1890 to December 1892.

South Australia.

Todd.

Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the northern territory, during the year 1890, under the direction of Charles Todd. Adelaide, 1892: folio, pp. 42 and 117, *maps.*

Victoria—Railway Guide.

Myers and Chambers.

The Victorian Tourists' Railway Guide, edited by "Telemachus" (Francis Myers), written and compiled by Francis Myers and Trant Chambers. Melbourne, Fergusson & Mitchell, 1892: 8vo, pp. 159, *maps.* Price 1s.

This is an official publication, and contains a succinct description of the Victorian railway system from the date of its origin, to its latest developments. It also includes a brief history of the railways, with the nature of the accommodation, and the character of the country traversed by each separate line.

Western Australia. *Jour. Roy. Colonial Inst.* 24 (1892): 6-52.

Fraser.

The Present Condition and Prospects of Western Australia. By Sir Malcolm Fraser, K.C.M.G.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.**Geodesy.**

Fennia (1892): 7, No. 1, pp. 196.

Bonsdorff.

Mesures de bases de Moloskovitz et de Poulkovo exécutées en 1888 avec l'appareil de Jäderin. Avec deux planches.

Geodesy.

Weiss and Schram.

Astronomische Arbeiten des k.k. Gradmessungs-Bureau . . . herausgegeben von Prof. Dr. Edmund Weiss und Dr. Robert Schram. IV. Band. Längenbestimmungen. Wien, F. Tempsky, 1892. Roy 4to, pp. 192.

Full discussion, by F. Kuhnert and A. Nahlik, of astronomical observations at Greenwich and Vienna, resulting in the time difference between the two observatories being fixed as 1 hr. 5 mins. 21.421 secs. \pm 0.021 secs. The preliminary observations for Berlin are also given by E. Becker.

Oceanography.

Pet. Mitt. 39 (1893): 85-88.

Krummel.

Russische Arbeiten zur Ozeanographie des Nordpazifischen Ozeans. Von Prof. Dr. O. Krummel. With map of salinity in colours.

Oceanic Research. *Comptes Rendus* 116 (1893): 539-540. **Thoulet.**

Sur l'emploi de cartouches solubles, dans les mesures et expériences océanographiques. Par M. J. Thoulet.

A proposal to actuate mechanism at great depths, by weights or springs set in action by the solution of a bar (used as a "toggle") in a certain definite time.

Pacific Ocean. *Trans. Geog. Soc. Pacific* 3 (1892): 63-83. **Tanner.**

Cable Surveys. From California to the Hawaiian Islands, 1891-92. By Lieut.-Commander Z. L. Tanner, U.S. Navy.

Valleys. **Wallace.**

Inaccessible valleys; a study in physical geography. By Professor Alfred R. Wallace: 8vo, pp. 13. *From the 'Nineteenth Century,' March, 1893.*

Mainly descriptive of the Yosemite Valley in California, and the valleys of the Grose and Cox Rivers in New South Wales.

GENERAL.

America and Australasia. **Meath.**

A Britisher's impressions of America and Australasia. By the Right Hon. the Earl of Meath: 8vo, pp. 21. *From the 'Nineteenth Century,' March, 1893.*

Biography—Penck. *Deutsche Rundschau* 15 (1893): 372-375. **Umlauf.**

Albrecht Penck, von Friedrich Umlauf. *With Portrait.*

Cannibalism. *Deutsche Rundschau* 15 (1893): 348-397. **Henkenius.**

Entstehung und Verbreitung der Anthropophagie. Von H. Henkenius, Stabsarzt a. d. in Heidelberg. (Mit einer Karte.)

Columbus. **Abbate.**

Il Genio e l'obbiettivo di Colombo. In rapporto alle condizioni geografiche contemporanee dell'Egitto. Memoria del Dr. Abbate Pascia, Presidente della Società Khédiviale de Géographie. Napoli, 1893, 8vo, pp. 32. *Presented by the Author.*

French Colonial Policy.

The Colonial Policy of France: 8vo, pp. 34. *From the 'Edinburgh Review,' April, 1893.*

Historical. **Martins and Bourtoune.**

Les Explorations des Portugais antérieures à la Découverte de l'Amérique. Par M. J. P. de Oliveira Martins. Traduite de l'Espagnol par Alexandre Bourtoune. Paris, Leroux, 1893: 8vo, pp. 34. *Map. Presented by M. A. Bourtoune.*

Historical. *Smithsonian Report* (1890): 611-639. **Watkins.**

The Log of the *Savannah*. By J. Elfreth Watkins.

Authentic account, with illustrations, of the first voyage of a steam vessel across the Atlantic.

Historical Geography. **Abbate.**

Dr. Abbate Pacha—De la prétendu Sphéricité de la Terre connu des anciens Egyptiens. Le Caire, 1893: 8vo, pp. 16. *Presented by the Author.*

A denial of the common statement that the true form of the Earth was known to the early Egyptians; all references in the "Book of the Dead," referring only to a flat rectangular Earth.

Historical Geography. *Mitt. Geog. Ges. Wien* 36 (1893): 100-117. **Gelcich.**

Lösung der Martin-Beheim Frage. Von Eugen Gelcich.

Historical Geography. **Winsor.**

The anticipations of Cartier's voyages, 1492-1534. By Justin Winsor, Cambridge, U.S.A. John Wilson & Son, 1893: 8vo, pp. 14, facsimiles.

Historical Geography—Hanno.**Fischer.**

Untersuchungen auf dem Gebiet der alten Landes- und Volkskunde.
 Von Curt Th. Fischer. Erstes Heft. De Hannonis Carthaginiensis
 Periplo. Leipzig, Teubner, 1893: 8vo, pp. 134. Price 3 marks. Pre-
 sented by the Publisher.

A Latin treatise on the 'Periplus' of Hanno.

Place Names.**Egli.**

Nomina Geographica. Sprach- und Sacherklärung von 42,000 geo-
 graphischen Namen aller Erdräume. Von Dr. J. J. Egli. Zweite
 vermehrte und verbesserte Auflage. Leipzig, Brandstetter, 1893: 8vo,
 pp. viii. and 1036. Price 28 marks.

The first edition of this fascinating work was published twenty years ago, and the
 Author now gives the results of his further studies in geographical etymology by way
 of addition and correction.

Population of the Earth.**Wagner and Supan.**

Die Bevölkerung der Erde, IX. Herausgegeben von Hermann Wagner
 und Alexander Supan. Ergänzungsheft Nr. 107 zu *Petermann's Mitteil-*
ungen. Gotha, Justus Perthes, 1893: 4to, pp. vi. and 130. Price 7 m.

This part contains comparative statistics of the censuses of 1890 or 1891 with
 those of the previous decade. A list of the largest towns of the Earth is given, in which
 270 are enumerated as containing over 100,000 inhabitants; of these 35 contain over
 500,000, twelve of them being over a million.

St. Paul and Amsterdam. *Ann. Geog.* 2 (1893): 329-354.**Velain.**

Les Îles Saint-Paul et Amsterdam (Océan Indien), avec figures et deux
 cartons par Ch. Velain, Paris.

NEW MAPS.

By J. COLES, *Map Curator, R.G.S.*

EUROPE.**Durham.****Bartholomew.**

Plan of Durham. Scale 1:15,330, or 4·8 inches to a geographical mile.
 Environs of Durham. Scale 1:235,000, or 3·5 geographical miles to an
 inch. W. H. Smith & Son's Series of Reduced Ordnance Maps for
 Tourists by J. Bartholomew, F.R.G.S. London. Price 1s. Presented by
Messrs. J. Bartholomew & Co.

England and Wales.**Ordnance Survey.**

Publications issued since April 12th, 1893.

6-inch—County Maps:—

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 106, S.E., 110, N.W., N.E., 122, S.W., 123, N.E., 146, S.W., 163, N.W., 174, S.E.,
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 15, 5s. each; CII. 8, 11s. 6d.; CIV. 3, 14s.; 4, 11s. 6d.; 8, 8s.; 12, 14s.;
 13, 5s.; CVII. 1, 6, 4s. each; CVIII. 9, 5s.; 10, 11, 12, 14, 15, CIX. 1, 4s.
 each; 2, 5, 6, 5s. each. Yorkshire, LIII. 1, 2, 3, 4, 6, 4s. each; 7, 3s.;
 8, 4s.; 10, 3s.; 11, 14, 15, 16, LXVII. 3, 4, 5, 6, 7, 8, 9, 4s. each; 10, 5s.;
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Plan of Nottingham. Scale 300 yards to an inch. W. H. Smith & Son's Series of Reduced Ordnance Maps for Tourists, by J. Bartholomew, F.R.G.S. London. Price 1s. Presented by Messrs. J. Bartholomew & Co.

This is a reduction from the Ordnance survey, and has been specially prepared with a view to the meeting of the British Association at Nottingham during the present year. It is drawn in a very clear style, and is well suited to the special purpose for which it has been published.

Switzerland.

Swiss Federal Staff.

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Zweisimmen-Gemmi. Scale 1:50,000, or 1·4 inches to a geographical mile. Topographical Bureau of the Swiss Federal Staff. Bern, 1892. Price fr. 5.

This is one of the series of maps now being issued by the Topographical Bureau of the Swiss Federal Staff, specially coloured to show the relief. It consists of sheets of the Siegfried Atlas of Switzerland, upon which the hill-work has been shaded in a most artistic manner.

Turkey.**"Les Missions Catholiques."**

Carte Ecclésiastique de l'Empire Ottoman d'après les "Missions Catholiques," 1893. Scale 1:3,500,000, or 47·6 miles to an inch. Supplément du *Journal des Missions Catholiques*. Paris: dessiné et gravé par R. Hausermann.

On this map are shown the extent and locations of the different Catholic Missions in the Ottoman Empire. In addition to this, the political divisions of the country, the roads, and railways are laid down, and at the foot of the map a large amount of information with regard to the Catholic missions is given in statistical form. An inset plan of Constantinople and its environs on an enlarged scale is given, and as the map is nicely drawn, and has evidently been compiled with care, it will be useful for general reference.

Tyrol.**Löwl.**

Karte der Intrusiven Kerne der Rieser Ferner. Von Prof. Dr. Ferdinand Löwl. Scale 1:100,000, or 1·3 geographical miles to an inch. With insets "Der Campellio Bruch," and "Der Granitbogen von Süd-Tirol." *Petermann's Geographische Mittheilungen*. Jahrgang 1893. Taf. 6. Gotha: Justus Perthes. Presented by the Publisher.

Vienna.**Freytag.**

Wand-Plan der Reichshaupt und Residenzstadt Wien, von Gustav Freytag, für Volks-Bürger und Mittelschulen bearbeitet, von Professor Dr. Friedrich Unlauff. Scale 1:10,000, or 7·3 inches to a geographical mile. Approbiert mit Erlass des h. k. k. Landesschulrathes Zahl 4159, vom 30 Mai, 1892. Verlag und Druck von G. Freytag und Berndt in Wien. 6 sheets. Presented by the Publishers.

This is a school wall-map of Vienna. It is printed in colour, and is drawn in a bold style, well suited to the purpose for which it is published. Full explanation is given with regard to the colouring and symbols employed; it also contains an inset, on an enlarged scale, of No. 1 Division of the city, and another, on a reduced scale, of Vienna inside the fortifications, showing the divisions of 1851.

ASIA.**Indo-China.****Pavie.**

Carte de l'Indo-Chine dressée sous les auspices du Ministre des Affaires Etrangères et du Sous-Secrétaire d'Etat des Colonies, par MM. les Capitaines Coupet, Friquegnon et de Malglaive, Membres de la Mission Pavie. Scale 1:1,000,000, or 13·6 geographical miles to an inch. 4 sheets.

This is a very important map, and contains a great deal of new work. It has been compiled by Captains Coupet, Friquegnon, and De Malglaive, members of the Pavie Mission, from the most recent and reliable sources. The map includes Tongking, parts of Burnah and Southern China, Siam, Anam, Cambodia, and Cochin China. It is printed in colours: the hill-work in brown, water blue, the routes in red. Wherever the rivers or routes have been reconnoitered they are distinguished from those which have not by the manner in which they are shown. The settled boundaries are indicated by red crosses. The size and importance of each town is shown by the symbol employed to indicate its position. At the foot of the map a useful table is given, containing the abbreviations and translation of the principal geographical terms that appear on the map. The scale is sufficiently large to admit of a considerable amount of detail being shown, and taken as a whole, the manner in which the map has been produced is very effective.

AMERICA.**California.****Gesellschaft für Erdkunde zu Berlin.**

Physikalische Skizze von Californien. Scale 1:4,000,000, or 55·5 geographical miles to an inch. Gesellschaft für Erdkunde zu Berlin. Sitzung vom 4 Februar, 1893. Presented by the Geographical Society of Berlin.

GENERAL.

The World.

Kiepert.

Kiepert's Grosser Hand-Atlas. Neue Lieferungs-Ausgabe in 45 Karten. Ausgabe in 9 Lieferungen à 5 Karten mit statistischem Material und Namen-Verzeichniss mit Bevölkerungsziffern zu jeder Karte. Die statistischen Angaben von Dr. Paul Lippert, Bibliothekar des Kgl. Preuss. Statist. Bureau. Dritte, in Zeichen-Institut der Verlagshandlung unter Leitung von Dr. R. Kiepert. Teils vollständig neu bearbeitete. Teils gründlich berichtigte Auflage. Berlin, 1893. Geographische Verlagshandlung Dietrich Reimer. Inhaber: Hoeser & Vohsen. Part II. Price 4 M. each part. Presented by the Publishers.

The second part of this atlas contains maps No. 7, The Rhine Provinces, Westphalia and Hessen-Nassau; No. 20, France (general); No. 21, Eastern France; No. 26, Scandinavia; and No. 38, The Nile Valley, and Western Arabia. The maps are very clearly drawn, the elevations of the land and the depths of the sea are given in metres. Each map is accompanied by an index and statistical letterpress.

The World.

Mayer & Luksch.

Weltkarte zum Studium der Entdeckungen mit dem Colonialen Besitze der Gegenwart. Entworfen und bearbeitet von Ernst Mayer und Josef Luksch, Professoren a. d. k. u. k. Marine-Akademie in Fiume, 1893. Equatorial scale 1:20,000,000, or 274 geographical miles to an inch. Verlag von Artaria & Co. in Wien. 6 sheets. Price 6 fl. Presented by the Publishers.

[This is a useful map for the purpose for which it is published. It is, however, hardly to be expected that it can give more than a very general idea of the exploration of the world. A table is given containing, in chronological order, the names of explorers by land and sea, together with a short note on the exploration. There is also a list of European colonial possessions in all parts of the world. The Spanish and Portuguese colonies in the sixteenth century are shown on a small inset map.]

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Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty. March and April, 1893. Presented by the Hydrographic Department, Admiralty.

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1057 Liverpool River entrance	Republished plan. Entrance to Liverpool River	1057
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North Atlantic.

U. S. Hydrographic Office.

Pilot Charts of the North Atlantic Ocean, for March, April, and May, 1893. Wreck Chart of the North Atlantic Coast of America. Published by the Hydrographic Office, Bureau of Navigation, Navy Department, Washington, D.C., 1893. Richardson Clover, Lieutenant-Commander, U.S.N. Hydrographer. Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.

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880	Marau Sound	New plan. Marau Sound	880
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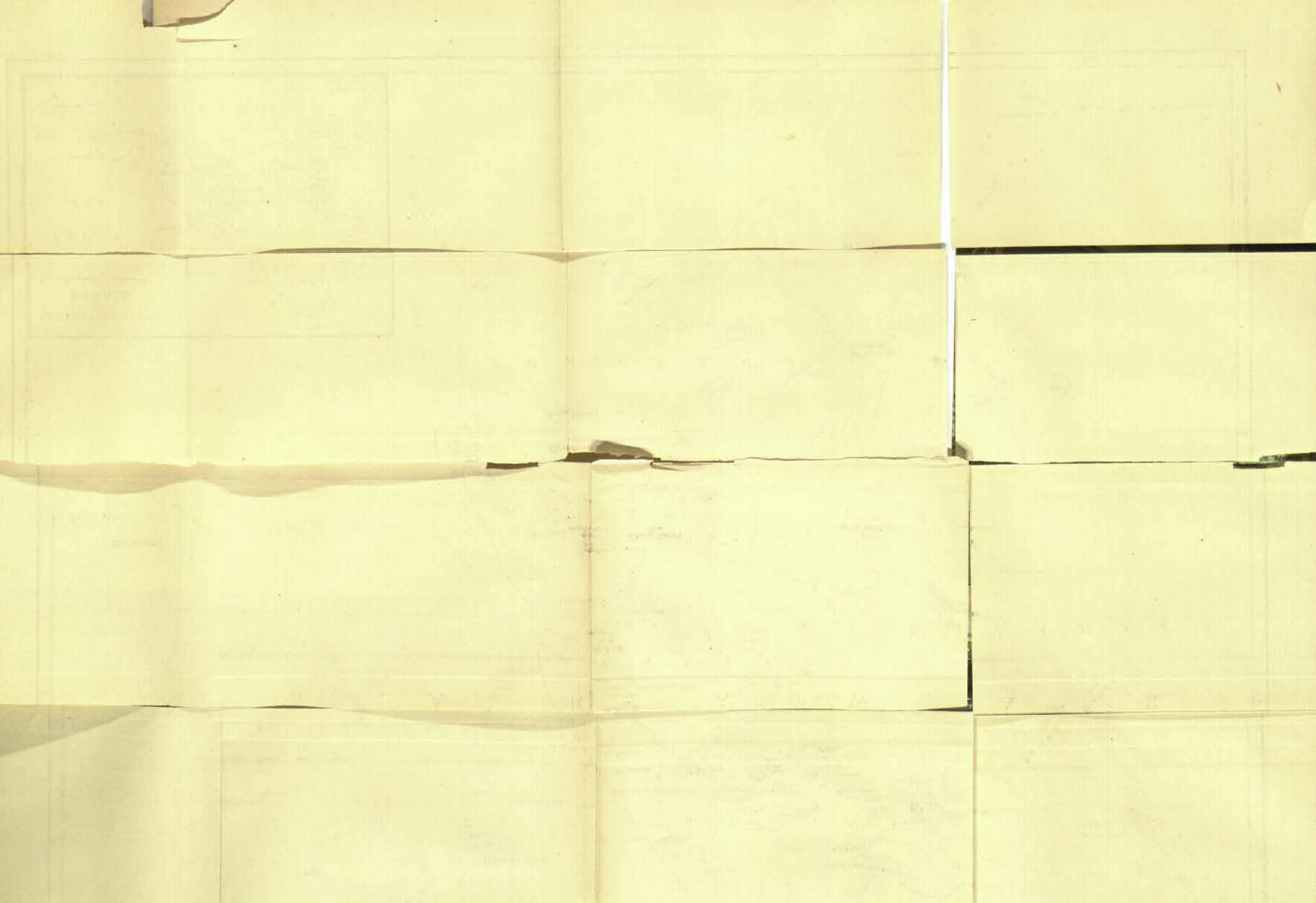
Central America.

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Ten Photographs of Ancient Carving in Stone and Wood excavated by A. P. Maudslay, Esq., and Dr. Bernoulli in Central America, in the neighbourhood of the Usumacinta River. Presented by Francis Parry, Esq.

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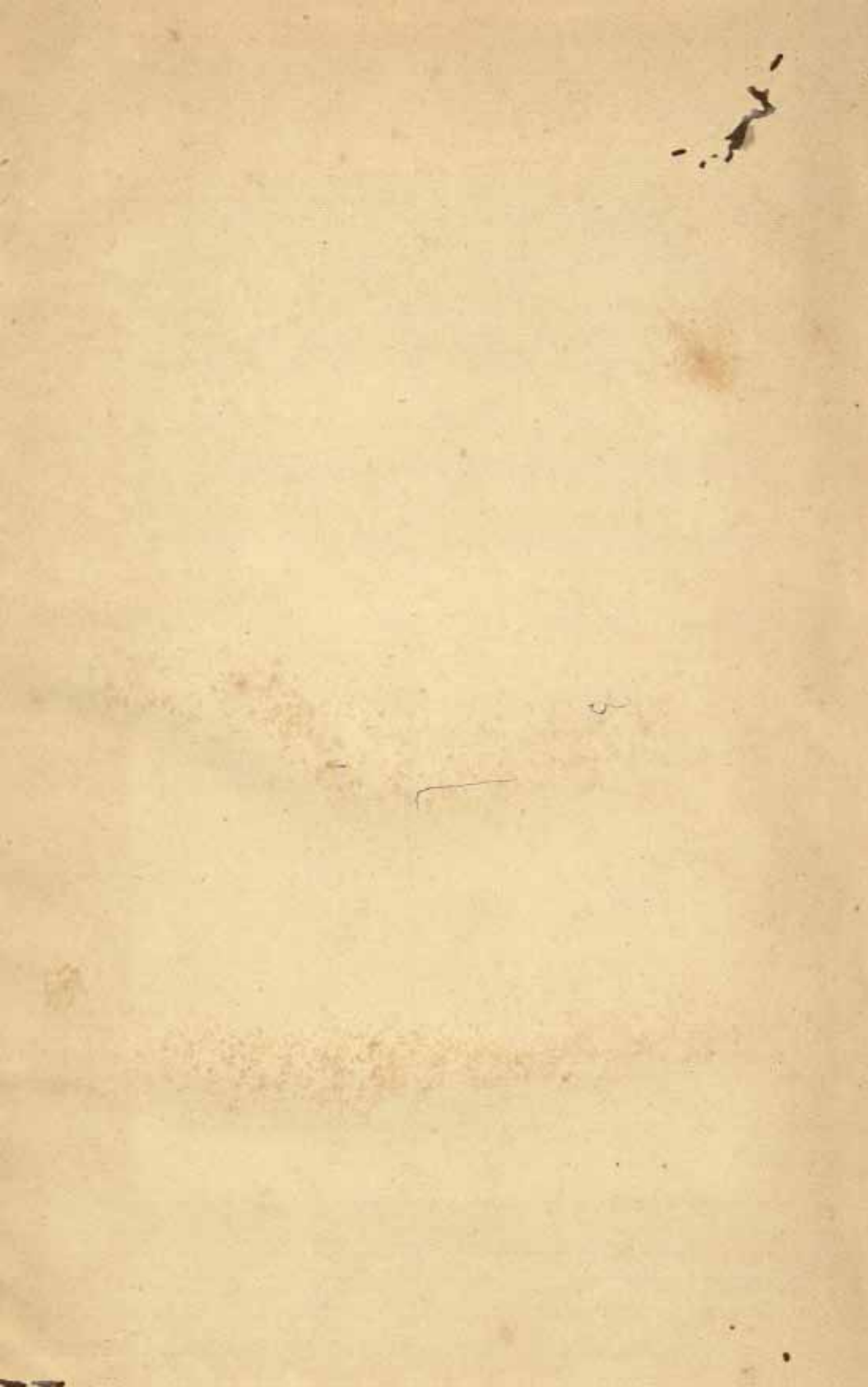
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